CITIZEN SCIENCE SDG CONFERENCE

14.–15.10.2020

Knowledge for Change: A decade of Citizen Science (2020–2030)
in support of the Sustainable Development Goals

Organiser

für Natur MUSEUM FÜR NATURKUNDE BERLIN

An official event of

eu2020.de

Funded by

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Partners

ecsa European Citizen Science Association

WeObserve

eu-citizen.science

CoAct Citizen Social Science

SoCiS Social Citizen Science for Addressing Grand Challenges

MUSÉUM NATIONAL D'HISTOIRE NATURELLE

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Objective of the conference

The CS SDG conference will bring together and highlight impactful citizen science initiatives, provide policy input to ongoing European developments and inspire the upcoming ten years of citizen science initiatives. The CS SDG conference will address this challenge by focusing on citizen science as a relevant approach to contributing to Global Challenges and industrial competitiveness in Horizon Europe, to the UN's Sustainable Development Goals (SDGs) and to building upon ongoing initiatives in the Open Science strategy, the European Research Area (ERA) and Horizon 2020. It will represent a crucial opportunity to bring together lessons learnt from initiatives at global, national, regional and grassroots level, to scale up their impacts, address existing challenges and harness the potential of citizen science towards achieving the SDGs. Some of the main conference outcomes will be a declaration and recommendations, gathering input in a collaborative way from conference participants and selected experts, focusing on the future of citizen science and its implementation in future funding programs.

The conference is an official event of Germany's 2020 EU Council presidency.

Funding

The conference is organised by the Museum für Naturkunde Berlin with many partners, generously funded by the European Commission and supported by the Federal Ministry of Education and Research Germany (BMBF).

Where and when

Berlin (Location: Kulturbrauerei) on the 14th and 15th of October 2020. In parallel to the conference, a Citizen Science Festival will take place for the Berlin public in the courtyard of the Kulturbrauerei, organised by Bürger schaffen Wissen - the German platform for Citizen Science - and funded by the BMBF. It will feature national and international projects with interactive booths to encourage people to participate in research.

The Declaration

The most important outcome of the conference is the formulation of a Declaration as a kind of social contract between citizen scientists, scientists and policy-makers. The contract is a voluntary commitment by all partners to advance the agenda of the SDGs according to their possibilities. Based on existing documents of citizen sciences (green and white books), the initiatives to foster citizen sciences, science communication, open science, and other relevant documents, the Declaration sharpens the function of citizen science for sustainable development and the SDGs.

Our world – our goals: citizen science for the Sustainable Development Goals

We, the authors, call on European institutions, EU member states and their research and innovation funding and performing organisations, private companies and civil society to make citizen science a key factor across all policies and activities relevant to the SDGs, including in shaping and implementing the European research agenda.

To achieve these, we make the following recommendations.

RECOMMENDATIONS

1. Harness the benefits of citizen science for the SDGs

- Through citizen science, citizens must be supported and encouraged to generate new scientific knowledge to support the SDGs, in collaboration with policy-makers, academia, research institutions, research funding agencies, researchers, citizens and civil society organisations and according to recognised and tested standards.
- Academia, universities and research institutes must be supported to restructure and open up to give space and opportunity for citizen involvement. Citizen science needs organisational forms to provide the approach with a route and framework and at the same time guarantee for quality.
- Policy makers and research funders should provide strategic and financial support to citizen science networks, capacity-building activities and initiatives, as well as to changes in research organisations, whilst also supporting the active engagement of EU citizens in implementing the SDGs.

2. Strengthen citizen science and its connections with other communities

- Citizen science networks and communities must interact more closely with thematic researchcommunities that produce scientific knowledge and technological innovation for the different SDGs, such as R&I for the environment, health R&I, food R&I, energy and transport R&I. Policies should be put in place to encourage and support citizen science networks and communities of practice focused on sustainability to enhance networking with diverse stakeholders (e.g. research organisations, non-governmental organisations, civil society organisations, policy-makers and private companies), and help to align citizen science activities with policy and research needs.
- To promote and create synergies, systems should be established to increase the coordination and exchange of citizen science information and tools relevant to the SDGs, across countries and at the global level, and across thematic areas.
- To ensure and increase the usability and acceptance of citizen science data and evidence in efforts to achieve the SDGs, citizen science communities should communicate transparently on the methodologies they use, potential bias in the data they generate, and their data quality management strategies.
- Authorities across Europe should further promote, encourage and support the application of data-management and data-sharing principles (e.g. FAIR1[1] and open data), and the release of technologies and tools that are open source and open access in citizen science initiatives, in order to ensure that citizen science data, technologies and tools are fit for science and policy purposes and, eventually, policy implementation.

3. Strengthen future citizen science systems

- Citizen science should be mainstreamed across the new Horizon Europe framework programme; this programme should also incorporate lessons from citizen science projects, and advice from citizen science experts, including on issues related to the European Green Deal.
- Curricula related to citizen science and the SDGs need to be developed for schools, higher education institutions and lifelong learning programmes, and adapted to different target groups. EU funding bodies should set up actions: support training and education institutes in incorporating citizen science; provide technical and legal support for citizen science practitioners; and reach out to local communities and schools.
- Funding for research into the science of citizen science is needed to advance the field, and how it can help achieve the SDGs and build expertise in a sustainable way.
- Funding for citizen science should allow for the special requirements of citizen science initiatives, including (among others) support for series of often small-scale experimentation, as well as for exploring different routes for the upscaling and long-term sustainability of initiatives aiming for social change.

1 – Findable, accessible, interoperable, reusable.

Annex 1.
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MUSEUM FÜR NATURKUNDE BERLIN

Leibniz Association

ENDORSE THE DECLARATION

Sign the Declaration by following this link **here!**

10.00–12.00 **Festival opening – get to know the Citizen Science projects and e-posters**

11.00–12.15 **On-site registration and lunch-time snacks**

12.15–12.30 **Welcome & conference opening** Johannes Vogel | Director General of the Museum für Naturkunde Berlin and Executive chair of ECSA

12.30–12.40 **Welcome words** Michael Meister | State Secretary at the Federal Ministry of Education and Research (BMBF), Germany

12.40–12.50 **Welcome words** Signe Ratso | Deputy Director-General, DG Research and Innovation, European Commission

12.50–13.00 **Short break**

13.00–14.00

KESSELHAUS | HOPIN SESSION #1

Citizen Science Policy – A panel discussion

Session chairs: Aletta Bonn and Susanne Hecker

Michael Meister
State Secretary, Federal Ministry of Education and Research (BMBF), Germany

Signe Ratso
Deputy Director-General, DG Research and Innovation, European Commission

Katrin Vohland
Director at the Natural History Museum Vienna, Austria

Muki Haklay
Professor of Geographic Information Science, University College London (UCL), UK

Klement Tockner
President FWF Austrian Science Fund, Austria

PALAIS | HOPIN SESSION #2

Who is engaged in Citizen Science – and who could or should be?

Session chair: Jens Jetzkowitz

Philipp Schrögel
Underrepresented audiences and exclusion factors in science communication

Claudia Göbel
Infrastructures of in/exclusion in Citizen Science: organisations, networks and policies

Rachel Pateman
Participation in citizen science and the SDGs in low and middle income country cities

Christine Urban and Michael Strähle
Democratizing science by Citizen Science: a realistic claim?

Stefan Reichmann
Matthew Effects in Citizen Science

MASCHINENHAUS | HOPIN SESSION #3

Mobility and renewable energy for sustainable cities and communities

Session chair: Kris Vanherle

Martina Hertel
A new tool, the Parking Policy Audit PARKPAD

Daniel Wuebben
Citizen Science and Community Renewables: Overlooked Allies for SDGs and a Green Recovery

Luisa Barbosa
Citizen science for citizen science in energy research

Kris Vanherle
Citizen engagement in the center of urban mobility planning

14.00–14.30

KESSELHAUS | PALAIS

Coffee and networking

HOPIN SESSION #E1

Meet the expert – Clement Tockner
President FWF Austrian Science Fund, Austria

HOPIN NETWORKING

Connect and get to know each other in a one-on-one meeting

14.30–15.00 **Plenary talk** What is citizen science, anyway? | Muki Haklay | Professor of Geographic Information Science, University College London (UCL), UK

15.00–15.30 **Plenary talk** Creating an enabling environment for citizen science in Europe | Anna Panagopoulou | Director, DG Research and Innovation, European Commission

15.30–16.00 **Plenary talk** Citizen science for monitoring and achieving the SDGs | Jillian Campbell | UN Convention on Biological Diversity, Canada

16.00–16.30

KESSELHAUS | PALAIS
Coffee and networking

HOPIN SESSION #E2
Meet the expert – **Jillian Campbell**
UN Convention on Biological Diversity, Canada

HOPIN SESSION #E3
Meet the expert – **Muki Haklay**
University College London (UCL), UK

16.30–17.30

KESSELHAUS | HOPIN SESSION #4
Citizen Science platforms as a way to impact on the SDGs
Session chair: Colombe Warin

François Grey
The Crowd4SDG project and the Citizen Science Solution Kit

James Sprinks
Assessing the impact of citizen science towards Sustainable Development Goals: The coordinators' point of view

Susanne Hecker
Citizens create knowledge: The networking platform for Citizen Science in Germany

Patricia Santos
CS-Track database: a central database of CS projects in Europe that can be key to understand the connection of CS and SDGs

PALAIS | HOPIN SESSION #5
Exploring human-nature-relations: Citizen Science in the Anthropocene
Session chairs: Marie Delannoy and Maike Weißpflug

Anna Berti Suman
Citizen sensing as a way to claim back human agency in the context of the Anthropocene?

Emu-Felicitas Ostermann-Miyashita
Citizen Science as a tool to Assess Human-Wildlife conflict and coexistence for wildlife species in human-dominated landscapes

Barbara Heinisch
The role of the citizen humanities in the biocultural diversity discourse

Frédérique Chlous and Maike Weißpflug
"Lost objects, Regained nature": a participatory project to tell the Anthropocene story from a citizen's point of view

MASCHINENHAUS | HOPIN SESSION #6
Citizens in biodiversity monitoring
Session chairs: Nike Sommerwerk, Jörg Freyhof and Martina Lutz

Eugenio Gervasini
Citizens' engagement in biodiversity monitoring: the "Invasive Alien Species in Europe" mobile App

Cristina Gonzalez Sevilleja
Engaging citizens will preserve butterflies in Europe: lessons learnt from the ABLE Project

Inian Moorthy
Natura Alert: Monitoring biodiversity threats using citizen science

17.30–18.30

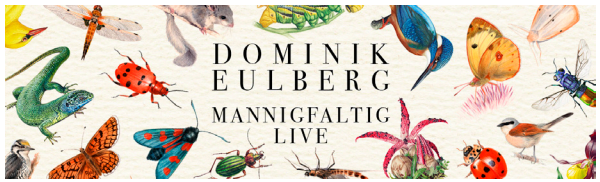
HOPIN FESTIVAL
E-Poster session

17.30–18.30

HOPIN FESTIVAL & KULTURBRAUEREI YARD
Citizen Science Festival 2020 – Virtual Festival & Guided Tours

21.00–23.00

HOPIN FESTIVAL & KESSELHAUS
Citizen Science Festival 2020 – featuring Mannigfaltig | Music by Dominik Eulberg



18.00–19.00 **Fingerfood and drinks**

19.00–19.30 **Start of evening event - welcome and introduction**

19.30–20.15 **Five parallel workshops to experience Citizen Social Science**

Citizen science is social!
Evening event with hands-on citizen social science

Social sciences and humanities research plays a growing role in citizen science and transformative social change becomes an essential dimension of impact. It is therefore time to talk about citizen SOCIAL science! Spend the evening with us and choose from a wide menu of hands-on activities and debates related to the social dimensions in citizen science practices.

PALAIS #EVENING1

Research Forum "What the heck is the 'Social' in Citizen Social Science?"
Tanja Ehmann and Stefan Thomas

KESSELHAUS | HOPIN SESSION #EVENING2

Inclusion, sustainability & citizen social science - fireside chat on challenges and learnings
Claudia Göbel and Justus Henke

Magdalena Meißner
Citizen Science for sustainable consumption and production

Reidun Norvoll
Working with youth at risk of social exclusion

HOPIN SESSION #EVENING3

Co-defining digital platforms to provide actionable insights along SDGs: mental health care provision and environmental justice
Valeria Arza & Josep Perelló

Franziska Peter and Josep Perelló
The co-creation of a chatbot for improving mental health care

Valeria Arza, Guillermina Actis and Pia Marchegiani
CoAct for environmental justice

HOPIN SESSION #EVENING4

Participatory approach centring life-world experiences
Mariam Malik and Teresa Wintersteller

MASCHINENHAUS | HOPIN SESSION #EVENING5

Nachhaltiges Leben in Stadt und Dörfern (Sustainable living in city and villages)
Susann Hippler

Andrea Isermann-Kühn and Rainer Leppin
Nachhaltige Mierendorff-INSEL in Berlin: Subsidiarität und Eigenverantwortung

Eleonore Harmel
Plattform Landinventur: Digitale Bestandsaufnahme

20.15–20.30 **Short break**

20.30–21.00 **Share and reflect experiences from the workshops**

21.00 **End of evening event**

SoCiS Social Citizen Science for Addressing Grand Challenges

CoAct Citizen Social Science

The event is co-organised by SoCiS project (funded by the German Federal Ministry of Education and Research -BMBF- Förderkennzeichen 16ITA210) and CoAct project (funded by the European Union's Horizon 2020 research and innovation programme under grant agreement number 873048).

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8.00–9.00 **On-site registration**

9.00–9.10 **Welcome**

9.10–9.40 **Plenary talk** Enhancing social dimensions in citizen science: SDGs and social tipping points | Josep Perelló | Associate Professor at the Universitat de Barcelona & UB Institute of Complex Systems, Spain

9.40–10.20

KESSELHAUS | PALAIS

Coffee and networking

HOPIN SESSION #E4

Meet the expert – **Josep Perelló**
Universitat de Barcelona and UB Institute of Complex Systems, Spain

10.20–11.20

KESSELHAUS | HOPIN SESSION #7

Opening Social Science & Humanities research towards society: Required institutional settings
Session chairs: Justus Henke, Claudia Göbel, Sylvi Mauermeister and Susann Hippler

SOCIS Social Citizen Science for Addressing Grand Challenges

Justus Henke, Claudia Göbel and Sylvi Mauermeister
Citizen Social Sciences and its institutional settings

Alexandra Albert
Citizen social science for sustainable cities and health in the Act Early Preventative Research Programme

Anna Cigarini
Building a participatory network for research on social support in mental health: Cooperation, mission-oriented research and actionable insights

Eveline Wandl-Vogt
beyond citizen science? the ars electronica research institute knowledge for humanity(k4h+)

PALAIS | HOPIN SESSION #8

Citizen observatories: the landscape, tools and data innovations for sustainable development
Session chair: Valantis Tsiakos

WeObserve

Inian Moorthy
LandSense: Coupling citizen science and earth observation data to promote environmental monitoring

Valantis Tsiakos
Citizens in the epicenter: Smart technologies in the service of citizen-driven flood monitoring and management

Joan Masó
Experiments with interoperability to unlock the meaning within Citizen Science data

Mel Woods
WeObserve Open Data Challenge: Reflections and implications of open data on the sustainability of Citizen Observatories (COs)

Saskia Coulson
Open source toolkits for Citizen Observatories

Núria Castell
Engaging citizens in improving air quality and designing healthy and people-centred cities. The NordicPATH project in Scandinavia

Louise Francis
The International Odour Observatory – A co-designed resource by and for the quadruple helix of stakeholders

Sven Manske
Using analytics for community monitoring and support in online citizen science projects

MASCHINENHAUS | HOPIN SESSION #9

Citizen Science for health and well-being
Session chairs: Xavier Basagaña and Valeria Righi

Isabelle Dechamps and Teresa Schäfer
How to engage citizens in co-creating open healthcare solutions: the careables toolkit

Nils Heyen
Patient Science: a new approach of Citizen Science for health and well-being

Yaela Golumbic
Investigating the world's most important medicines through citizen science

Rosa Arias
The D-NOSES project: Improving the health & well-being of affected communities by odour pollution using citizen science

Elisabetta Broglio
Genigma: a citizen science game to explore cancer cells DNA

11.20–11.30 **Short break**

11.30–12.30

KESSELHAUS | HOPIN SESSION #10

Participatory Citizen Social Sciences towards the SDGs

Session chairs: Stefan Thomas and David Scheller

CoAct Citizen Social Science

Francesco Mureddu
Stakeholder engagement methodologies and practices for citizen (social) science

Emilia Aiello
Towards a transformative Citizen Social Sciences for the accomplishment of the SDGs

Margarida Romero
Addressing the Sustainable Development Goals through the design of digital games by middle school, high school and apprentices

PALAIS | HOPIN SESSION #11

Contribution of Citizen Science Data to Monitoring the SDGs

Session chair: Dilek Fraisl

WeObserve

Steffen Fritz
Citizen science to complement official statistics and mobilize action

Jillian Campbell
Citizen science for the SDGs and official monitoring

Camden Howitt
Litter intelligence: Citizen Scientists delivering on SDG 14.1.1.

Anne Bowser
Organizing to support Citizen Science for the SDGs

Omar Seidu
Citizen Science to strengthen the National Statistical System

MASCHINENHAUS | HOPIN SESSION #12

Lightning talks

Session chairs: Kim Mortega and Silke Voigt-Heucke

Stavros Katsanevas
REINFORCE (REsearch INfrastructures FOR Citizens in Europe) presented under the lens of SDG4, 5, 10, 13, 14, 15 and SDG17

Marta Soler Gallart
SOLIDUS-Solidarity in European societies: empowerment, social justice and citizenship

Rémy Bossu
“OMG, Earthquake!” From citizens as real time tremor sensors to active citizen seismologists

Jóhann Helgi Stefánsson
Land Users – Land Watchers

Thorsten Kluss
Beekeepers, Makers, and Eco Hackers: The Outreach of Citizen Bob and a DIY Sensorkit

Norbert Steinhaus
Citizen-enhanced climate actions – a Pan-European perspective

Giulia Barbero-Vignola
Harnessing Individual lifestyle choices for engaging citizens in sustainable development – The example of the consumer footprint calculator

12.30–13.30

HOPIN FESTIVAL

E-Poster session

mitforschen! Das Citizen-Science-Festival

HOPIN FESTIVAL & KULTURBRAUEREI YARD

Citizen Science Festival 2020 – Interaction and diversity for a sustainable society

13.00–14.00

PALAIS | KESSELHAUS

Lunch break

13.30–14.00 HOPIN SESSION #E5

Meet the expert – **with Anne Bowser**
Woodrow Wilson International Center for Scholars, USA

14.00–14.30 **Plenary talk** Openness as a pathway to support the SDGs: an exploration of science-society mediation spaces | Thomas Mboa | University of Ottawa, Canada

14.30–14.40 **Short break**

14.40–15.40

KESSELHAUS | HOPIN SESSION #13

Evaluation of programmes and projects: instruments, outputs, outcomes – PART 1
Session chairs: Nicola Moczek and Barbara Kieslinger

Sabrina Kirschke
Design and effects of citizen science projects in freshwater quality monitoring. Results of a global survey

Carmen Kilvits
Effectiveness of participation in environmental citizen science projects: the case of Estonia

Laure Fallou
Citizen-seismology in Haiti, understanding citizens' interest and beliefs to enhance community resilience and contribute to risk reduction

Alexander Gerber
Evaluating participatory processes critical to citizen science and sustainable development

PALAIS | HOPIN SESSION #14

Transformative potential of citizen science and citizen observatories for mobilising action towards achieving the SDGs
Session chair: Uta Wehn

WeObserve

Panel discussion

Valantis Tsiakos
Institute of Communication & Computer Systems (ICCS)

Mel Woods
University of Dundee

Michele Ferri
Alto Adriatico Water Authority

Steffen Fritz or Inian Moorthy
International Institute for Applied Systems Analysis (IIASA)

Stijn Vranckx
VITO

MASCHINENHAUS | HOPIN SESSION #15

Responsible food consumption and production through Citizen Science
Session chairs: Ina Opitz and Anett Richter

Anett Richter
The power of Citizen Science for Policy: examples and experiences in environmental citizen science and policy

Jessica Amprako
The impact of citizen science towards sustainable production of aromatic plants

Rachel Pateman
Citizen science and the food system: opportunities for reducing loss and waste

Siri Carson
Citizen engagement in biotechnology innovation – the need for research and the role of ethics

Danielle Wilde
ReThinking Food: empowering citizens in societal change processes

Roberto Rufo Gonzalez
The Food Waste Experiment – a novel method for calculating food waste

15.40–16.15 PALAIS | KESSELHAUS

Coffee and networking

HOPIN SESSION #E5

Meet the experts – **Linden Farrer and Michael Arentoft**
Directorate-General for Research & Innovation, European Commission

16.15–17.15

KESSELHAUS | HOPIN SESSION #16

Evaluation of programmes and projects: instruments, outputs, outcomes PART 2

Session chairs: Barbara Kieslinger and Nicola Moczek

Margarida Sardo
Are we on the same page? Making project engagement and evaluation work across European cities and cultures

Nerea Ferrando
Debunking myths of data quality issues in citizen science

Giovanni Maccani
Scalable by design: a Framework to design more impactful CS interventions

Antonella Passani and Annelli Janssen
Developing a modular, flexible and scalable impact assessment framework for Citizen Science projects following a co-design approach

PALAIS | HOPIN SESSION #17

Citizen Science for sustainable education

Session chairs: Gitte Kragh and Jacob Sherson

Jacob Sherson
Playing games for science and the SDGs

François Grey
Citizen science for the SDGs: the Crowd4SDG project

François Taddei
Towards a citizen science of sustainable education

Carol O'Donnell
Integrating Citizen Science into Global Goals Curriculum for Youth Ages 8-17

Thomas Kox
Activating students for climate change adaptation by collecting and communicating data of extreme weather events

David Kocman
Citizen Science as part of the elementary school curriculum: case-study of technical day on the topic of noise and health

Claire Ramjan
Does environmental citizen science in schools provide opportunities for pupils to engage in ecological citizenship?

Daniëlle Meuleman
Nature around the Corner: involving underprivileged children in citizen science

CONTINUED #17

Samantha Mason
Empowering children to learn about, connect with, and care for nature through participation in the citizen science project MammalWeb

Yoseph Araya
Mobile device data collection from Malawian macadamia farmers for agricultural research and teaching in the context of Sustainable Development Goals

HOPIN SESSION #18

WeObserve showcase: demonstrating value and applications of Citizen Observatory data

Session chair: Valantis Tsiakos

Turam Purty
WeObserve Open Data Challenge – CitSci Manager

Gulsen Otcu
WeObserve Open Data Challenge – Hi-Terra

Valantis Tsiakos
INSPIRE Hackathon – Results from the citizen science challenges

Valantis Tsiakos
Citizen Observatories for Earth Observation (CO4EO): From examples to best practices

MASCHINENHAUS | HOPIN SESSION #19

Partnerships towards the goals – Making sustainable change sustainable with Citizen Science

Session chairs: Jörn Knobloch and Claudia Fabó Cartas

STIFTUNG MERCATOR

Nicola Moczek
First insights into the survey: The contribution of European Citizen Science projects to the UN sustainable development goals (SDGs)

Jan-Philipp Beck
EIT Health partnership model as an innovative solution towards addressing the societal health challenge

Macarena Cardenas
Creating sustainable cities in partnership: Investigating nature-based solutions through citizen science

Kim De Rijck and Sven Schade
Best Practices in Citizen Science for Environmental Monitoring

Maria Vicente
Drinkable Rivers – Citizen Science as a tool for the involvement of the local community in monitoring water quality of the Douro River

17.15–17.30	**Short break**
17.30–18.00	**Declaring the Declaration**
18.00–18.15	**Closing ceremony**
18.15	**End**

3. ABSTRACTS

PLENARY TALKS

What is citizen science, anyway?

Muki Haklay

Short CV

Muki Haklay is a Professor of Geographic Information Science at University College London (UCL). He is the founder and Co-director of the UCL Extreme Citizen Science group, which is dedicated to the development of technologies and methodologies to allow any community, regardless of their literacy, to use scientific methods and tools to collect, analyse, interpret and use information about their area and activities. The group has developed a range of technologies that can be used for participatory science and mapping, including the Sapelli data collection suite, and the GeoKey framework for the capture and management of participatory mapping information. In addition he is co-founder and director of the social enterprise 'Mapping for Change', which provides services in participatory mapping and citizen science. He was an inaugural board member of the Citizen Science Association, and is the co-vice chair of the European Citizen Science Association. He has extensive experience in citizen science projects, including EveryAware (FP7 FET), Citizen Cyberlab (FP7 ICT), WeGovNow! (H2020 CAPS), Doing It Together Science and EU-Citizen.Science (H2020 SwafS), and ECSAnVis (ERC Advanced Grant).

Abstract

While at first sight, citizen science seems to be clear – it is about the participation of members of the public in the research process in a way that directly contributes to the creation of novel knowledge, a more accurate definition has been challenging the field of citizen science throughout its development. A recent effort of analysing over 35 different definitions demonstrated the subtle differences and the areas of contention. What is the level of cognitive engagement we expect from participants? If they pay to participate in a project, is that OK? In what situation should the participants get paid, or is that no citizen science? And what about if the project is led by a for-profit company? These and many other questions about what should be considered as a citizen science activity are gaining importance. For example, when setting up a national or international platform for sharing citizen science projects and deciding which projects will be included. This is also the case when creating a new funding scheme to support citizen science for the SDGs and setting criteria for evaluating funding applications. There is a special complexity with citizen science, since the definition of what counts as citizen science activity can be different between disciplines and practices. The talk will describe a process that was carried out at the end of 2019 and the beginning of 2020 to identify common characteristics of citizen science projects through a survey of views about case studies (vignettes) that were presented to people who are involved in citizen science and public engagement and understanding their views about different scenarios. Based on 330 responses and over 5000 gradings of 50 vignettes, it was possible to identify the area of agreement and disagreement. We will look at ECSA characteristics of citizen science, and consider the challenges that they present to the development of the field. We will also discuss how these characteristics can be integrated into efforts of aligning citizen science activities with the SDGs.

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Creating an enabling environment for citizen science in Europe

Anna Panagopoulou

Short CV

Ms Anna Panagopoulou joined the European Commission from the private sector in 1997. Between 1999 and 2009, she was policy officer in DG MOVE/ENER, where she worked on EU transport and energy infrastructure policy, research policy, and international cooperation. She then joined the Innovation and Networks Executive Agency (INEA), initially as Head of Unit and, from 2014, as Head of Department for Programme Support and Resources. Since July 2016, she has been the Director of the Common Implementation Centre in DG Research and Innovation. The directorate designs the strategy and provides the framework for coherent and simplified implementation of the EU R&I programmes. It provides comprehensive services and advice on legal, audit, business process and IT issues. As the one-stop-shop for data, reporting, and monitoring of the framework programmes, it provides knowledge to support policy-making and to stimulate the exploitation of results. Recently she also undertook the responsibility as acting Director of DG R&I Directorate G "Research and Innovation Outreach". Directorate G reinforces at crosscutting level the engagement with citizens & society, with academic and research organisations and with research and industrial infrastructures. It helps to ensure that researchers, knowledge and technology circulate freely within a revitalised and reinforced European Research Area (ERA), which generates investment, national reforms and EU policies to create critical mass within a coherent R&I policy framework.

Abstract

Citizen science has grown in recent years from demonstrating that it can have value to ensuring it is conducted to the highest standards of practice. None of this would have been possible without the dedicated efforts made by citizen science practitioners and citizens themselves. The European Commission has been supporting societal engagement through its Framework Programmes since the turn of the century. Lately, it has stepped up support, under the banner of "Responsible Research and Innovation", and by launched numerous projects focused on 'doing citizen science'

across all areas of science in the Science with and for Society part of the programme. However, what is needed alongside these kinds of projects is fundamental changes within research funding and performing organisations that open them up to society. Efforts began in Horizon 2020 and will continue in Horizon Europe. In fact, Horizon Europe promises to be a step-change towards collaborative forms of research, and this presents a big challenge to the citizen science community, other research and innovation actors, policy makers and funders. Only by collectively supporting citizen science, and opening governance up across stakeholder organisations, will we see citizen science play its full role in supporting and working towards the Sustainable Development Goals by 2030.

AP: DG RTD, European Commission

Citizen science for monitoring and achieving the SDGs
Jillian Campbell

Short CV

Jillian Campbell led the statistical work at UNEP from 2015-2020. This included leading the methodological work on the Sustainable Development Goal (SDG) indicators under UN Environment custodianship and coordinating global capacity building activities related to SDG indicators and environment statistics. She was also responsible for identification of opportunities to use new data sources (citizen science data, satellite data, etc.) to better understand the environment and environment change, and for promoting the use of environmental data and information for analysis and for strengthening of the science-policy interface for the environment and building a digital ecosystem for the environment. In July 2020, Jillian joined the UN Convention on Biological Diversity and is now working to apply a similar approach to monitoring the post 2020 global biodiversity framework. Before joining UN Environment (UNEP) in 2015 she was Programme Officer and Statistician at the UN Economic and Social Commission for Asia-Pacific (UN ESCAP) based in Bangkok (Thailand) and in Suva (Fiji) where she worked on environment statistics and environmental-economic accounting, her work at UN ESCAP included designing and implementing capacity building activities with a focus on the System of Environmental Economic Accounting (SEEA) and managing the production of the ESCAP Statistical Yearbook for Asia and the Pacific. Prior to her work in the Asia-Pacific region she was based in the UN Statistics Division of DESA in New York where she worked on economic statistics and national accounts.

Abstract

Currently there are major gaps in being able to monitor the environmental dimension of the SDGs and the environment more broadly. 68% of the environment related SDGs lack data for global monitoring. Citizen scientists collect data that can be used to fill these gaps. However, citizen science and citizen generated data is currently under utilized in monitoring the SDGs and in official monitoring more broadly. This is due to a lack of awareness of the scope and availability of citizen science data, difficulties in accessing and integrating data, a lack of availability of information on methodologies and quality assurance and the need for guidance and demonstrations of how citizen science can be used. UNEP has been working to demonstrate the value of citizen science data for global and national monitoring of SDG 14.1.1 on marine litter. Not only have we been able to develop products that improve local, national and global tracking of SDG 14.1.1, but the information generated can also feed back into communities to stimulate citizen engagement, to highlight where beach clean-ups are needed, to stimulate activism related to reducing single-use plastic and to increase interest in protecting the marine environment. Marine litter is just one example. It could be replicated for other SDGs and for other areas of official statistics, for example the monitoring of the upcoming Global Biodiversity Framework. Citizen science not only has the potential to fill data and information gaps, but also to inspire citizens to engage – only when citizens, policy makers and scientists work together will we be able to achieve the SDGs.

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Enhancing social dimensions in citizen science: SDGs and social tipping points
Josep Perelló

Short CV

PhD in Physics, Associate Professor at the Universitat de Barcelona and researcher at UB Institute of Complex Systems. In 2013, he founded OpenSystems, a research group that runs scientific research based on citizen participation and artistic practices and under the broad label of Citizen Social Science. He is currently coordinating the EU H2020 project Collective Design of Citizen Social Science for Collective Action (CoAct) which proposes a new approach to face social global concerns related to mental health care, youth employment, environmental justice and gender equality by engaging citizens as co-researchers. CoAct approach represents a new understanding of the underexplored field of Citizen Social Science (CSS), understood here as participatory research co-designed and directly driven by citizen groups sharing a social concern. Besides CoAct, his primary focus is analyzing human behaviour in urban contexts in a participatory manner: from climate justice to gender violences or human mobility. Aiming to collectively respond to specific social concerns, OpenSystems has run more than 15 public experiments with more than 2,500 participants. Most of them were done in collaboration with public administrations in regional or municipal levels. He has been coordinating Barcelona Citizen Science Office (until 2018, and founder in 2013), an initiative of the Barcelona City Council, that works as a community of practice of a large number of projects and implements specific programmes in civic centres, primary schools as well as high schools.

Abstract

The pursuit of sustainable goals entails substantial technological and scientific advancements. However, commitment and

cooperation from vast segments of our societies is also required to turn the efforts into actions. Just a mention from a straightforward example: climate stabilization is not only a scientific and technological task, it also depends on activating processes of social change on several levels. An interesting concept to raise here is the social tipping point, which is a point where a group rapidly and dramatically changes its behavior by widely adopting a previously rare practice. The concept, taken from the field of behavioural sciences, has strongly emerged in climate literature but it is potentially of interest to face any other urgent societal challenge. Due to its participatory spirit, citizen science provides a framework to further reflect on the notion of social tipping point and integrate social dimensions into any specific SDG oriented research activities. Grounded on our current CoAct EU project, the presentation will discuss a general model for a citizen social science which offers communities, groups or individuals the possibility to directly intervene into scientific research and to then actively contribute to SDGs. Citizen social science engages citizen bodies concerned with specific social issues in co-research and imagines the possibility to support demands of the public with scientific evidence. The joint effort represents itself a way to reinterpret scientific practice, much closer to collective action and policy making and very much linked to public debate. The presentation will take experiences from contexts such as climate justice, mental health care provision, air pollution exposure, gender biased interactions in public spaces among others to encourage a further enhancement of social dimensions in citizen science practices if they want to more effectively support SDGs.

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Openness as a pathway to support the SDGs: an exploration of science-society mediation spaces

Thomas Mboa

Short CV

Thomas Mboa is a researcher in Information and Communication, with interest in the Maker Movement, social Innovation, Open science and Scholarly Communication. He is currently at Queen Elizabeth II Fellow with OpenAIR at University of Ottawa. Thomas Mboa is deeply engaged to promote DIYbio and democratise Biotechnology in Africa. His work with DIYBio is visible through his own biohackerspace in Cameroon: the Mboalab, which is part of the Open Bioeconomy Lab. He also operates through the Africa Open Science & Hardware network which he co-leads. He is also the President of APSOHA (Association for the Promotion of Open Science in Haiti and Africa).

Abstract

I aim to discuss how science-society mediation spaces like Fablabs and other makerspaces can contribute to the Agenda 2030. To this end, my presentation is divided in four parts: the first part, clarify the link between Open science, citizen science and openness. The second part focuses on the maker movement and shows how digital technologies have created new forms of openness to society within technoscience. The third part discusses how science-society mediation spaces enable citizens to contribute to science with their capacities and expertise; and shows the evidence of the contribution of openness to society in support of SDG. The fourth part presents concrete examples based on activities of movement like Africa Open Science and Hardware summit (AfricaOSH), to show how openness has ensured a quick response against COVID-19 pandemic. Finally, based on decolonial thinking, I will conclude with some recommendations to avoid practices that can prevent the full potential of openness to support SDG.

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THEME 1.
ADDRESSING GLOBAL CHALLENGES
Citizen Science for health and well-being

Format: 8-minute presentation + 3-minutes Q&A each presentation.

Session chairs

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Citizen science is increasingly being used in health-related research. For example, citizens can help track epidemics in real time, contribute to important scientific research about folding proteins, or explore questions such as how pollution and odours are affecting our health. In this session, we will focus on issues around data quality, methodologies and research results, and on how citizen science in health and biomedical research can be integrated into policy making.

How to engage citizens in co-creating open healthcare solutions: the careables toolkit

***Isabelle Dechamps, Enrico Bassi, Daniel Wessolek, Teresa Schaefer and Barbara Kieslinger**

Healthcare services and systems have changed massively this last century, and a great number of citizens worldwide have profited from these changes. Nevertheless, the WHO acknowledges that numerous citizens still lack access to affordable healthcare, even in Europe. The combination of a growing demand of healthcare services, the rising costs, and cutbacks in budget have brought down the welfare system, as this was built after the Second World War. The development of new health care solutions is mainly based on commercial business models, driven rather by profit margin rather than by particular user needs. Especially looking at people with physical - temporary or permanent - limitations, the offer of products and services that fit their health-related needs are limited. The H2020 project „Made4You“ addresses these shortcomings and engages care-receivers, healthcare professionals and designers in the co-creation of „careables“: tailor-made open solutions that tackle permanent or temporary disability. The co-creation process of such tailor-made solutions is not always easy; it requires a good understanding of patients' needs from the designers and a comprehension about the potentials and limitations of digital fabrication from healthcare professionals and patients. To address this challenge, researchers, patients and designers have jointly created a toolkit that provides a set of guidelines and templates to organise participatory co-design processes for open source healthcare. The toolkit is the result of numerous hands-on experiences and can be applied by all those who want to get involved in the user-centred creation and sharing of personalised health care solutions. Creating a fruitful environment, in which organisations and individuals can successfully work together and develop freely innovative design solutions, based on the needs of individual patients, is a core principle of the process. In the session we want to introduce the toolkit and bring practical examples of its application in the work with patients, health professionals, researchers, designers and engineers.

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Patient Science: a new approach of Citizen Science for health and well-being

Nils Heyen

Citizen science in health-related fields usually follows the approach of crowdsourcing or crowd science where laypersons primarily have a supplying role in data collection. Citizen scientists might, for instance, use digital devices to record and report whenever they have an allergic reaction, or they gather concrete symptoms and their experiences with specific drugs, or they help to target cancer cells in visualized pathological data. By contrast, we set up a citizen science project on a much higher engagement level (extreme citizen science or participatory science, in Haklay's sense). This project called "Patient science for the investigation of rare diseases – a citizen science study on cystic fibrosis" has been funded (2017–2020) by the German Federal Ministry of Education and Research (BMBF) within its research funding program for citizen science. Here, a team of professional and citizen (patient) scientists has jointly planned, implemented and evaluated a scientific study on cystic fibrosis from which the patient scientists themselves suffer (cystic fibrosis is a genetic metabolic disease that produces a very thick mucus in many organs of the body; it can be treated, but is still incurable and strongly influences the lives of patients in many ways). The aim of the project is twofold: first, to explore the typical and major problems in the everyday life of cystic fibrosis patients and their relatives and thus to contribute to solving these problems and improving their well-being; and second, to investigate the potentials and limits of "patient science" as a new citizen science approach. In my presentation, I will, first of all, briefly introduce the patient science project and some empirical results. I will then show the high potential of these results for being used in policy making in order to improve the patients' everyday life conditions. Finally, I will reflect on the potentials and limits of the patient science approach. The limits include the lacking physical resilience of the patient scientists that affects the project management as a whole; whereas one of the main potentials is the systematic use of the patients' expertise on everyday life and coping with the disease.

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Investigating the world's most important medicines through citizen science

***Yaela Golumbic, Kymberley R Scroggie, Hung Phat Duong, Peter J Rutledge and Alice Motion**

Essential medicines are defined by the World Health Organization (WHO) as pharmaceuticals that satisfy the priority health care needs of the population. These should be available within the context of functioning health systems, at all times, in adequate amounts and at affordable prices. However, this goal is often not realized, with many medicines overpriced and medicine production based on competition and profit considerations. The third of the Sustainable Development Goals (SDG) is to "Ensure healthy lives and promote wellbeing for all at all ages". This offers an opportunity for a sustained global effort to ensure the availability, accessibility and affordability of these medicines, to ensure people remain healthy and productive throughout their lives. One obstacle to achieving this goal is information sharing, mutual learning and transparency; when this is lacking, efficient decision-making is hampered and opportunities for negotiating prices and strategic procurement are limited. The E$$ENTIAL MEDICINE$ project mitigates these pitfalls using citizen science, harnessing the power of the crowd to investigate the accessibility of medicines around the world. E$$ENTIAL MEDICINE$ engages the public in drug discovery research, reviewing and gathering information on the availability and cost of medicines, making this information widely accessible, and breaking down information barriers. Working with open science principles, E$$ENTIAL MEDICINE$ has successfully formulated a database of essential medicines that are approved for use in the USA and is now expanding this database to countries around the globe. Volunteers can participate in diverse ways, sharing their expertise and knowledge to take the project in new directions and implement sustainable strategies to promote the accessibility of essential medicines.

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The D-NOSES project: Improving the health & well-being of affected communities by odour pollution using citizen science

***Rosa Arias and Nora Salas Seoane**

Odour pollution is the second cause of environmental complaints after noise across Europe (Dunod, 2005). Frequent exposure to environmental odours is associated with headache, gastric symptoms, stress, anxiety and respiratory problems (Sucker et al. 2009; Miedema et al. 2000; Ragoobar et al. 2016). However, there is still a research gap in the relationship between odours and health. Odour issues affect entire communities arising socio-environmental conflicts and negatively influencing their health and well-being. Yet, odour pollution has repeatedly been ignored in environmental regulations and policies worldwide leaving citizens defenceless. D-NOSES is a highly ambitious H2020 project born from the will to provide innovative solutions to this largely neglected problem by reversing the way in which it has been traditionally tackled. D-NOSES considers for the first time the perception of odours of affected citizens and associated well-being to gather real-time odour observations to objectivise the problem. The project aligns with SDG3, Good Health and Well-being, by guaranteeing a healthy environment and increasing the quality of life, contributing to target 3.9 reducing the deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. Using citizen science and participatory strategies, citizens can build collaborative odour maps through the OdourCollect App, which contributes to promote dialogue between public authorities, industries and academia – quadruple helix model – to co-create innovative solutions to increase air quality and improve their well-being. The project is running 10 pilots in 9 countries in Europe, Chile and Uganda to improve the health and well-being of citizens by influencing policies at the local, national and global levels. One of the D-NOSES countries is already drafting a national law to regulate odour pollution, a big success associated with the project actions. In Spain, a working group is drafting a standard for using citizen science to monitor odour pollution. Moreover, D-NOSES is also undertaking research on the effect of frequent exposure to odours and the related chemicals to health. These initiatives contribute to target 3.d from SGD 3 strengthening the capacity of all countries for early warning, risk reduction and management of national and global health risks.

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Genigma: a citizen science game to explore cancer cells' DNA

***Elisabetta Broglio, Marco Di Stefano, Juan Antonio Rodríguez, Marc Marti-Renom and Jonas Krebs**

The human genome is a sequence of 3,000 million letters folded in three dimensions. Its sequence and 3D folding determine how cells function. We know that in cancer cells specific rearrangements of the genetic material occur and modify the "original" sequence leading to alterations in the vital functions. Since each cancer has its own different rearrangements, scientists need cancer-specific genomic references to advance research and explore new medical treatments. Currently, researchers determine rearrangements using algorithms that find the best order of genome fragments to finally obtain the sequence of cancer cells. However, algorithms can fail, and scientists often rely on manual refinement since human eyes perform much better than machines in identifying visual patterns. In Genigma (www.genigma.app), we co-created with citizens a game for smartphones to assemble the 3D genomes of breast cancer cell lines in a crowdsourced manner. This project runs as a pilot in the framework of the H2020-SWAFS project ORION Open Science, to test if it is possible to advance genomic research more quickly and effectively by involving citizens in different steps

of the process. Genigma will also help research in artificial intelligence (AI) algorithms: using the results from the game, we will investigate, if patterns frequently identified by the human eye can be used to train AI. In 2019, we ran 3 co-creation events engaging around 120 people of various backgrounds, incl. gamers, designers, patients, medical doctors, teachers, artists and scientists from diverse disciplines. Thereafter, more than 150 people tested a first version of the game. Researchers are checking its functionality using healthy cells with known DNA sequences to assure the robustness and quality of the data. During the game, players learn about genomics, 3D DNA structures, open science and cancer biology and receive feedback from researchers on the scientific progress weekly via web, social networks and email. Last tests before the launch will be performed during September 2020. The game will be free to download and results will be published in open access. A big effort to disseminate will be done, with special attention to patient associations and schools to generate debate and increase knowledge.

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THEME 1.
ADDRESSING GLOBAL CHALLENGES
Mobility and renewable energy for sustainable cities and communities

Format: 10-minute presentation + 5 minutes Q&A.

Session chair:
Kris Vanherle, Researcher | Transport & Mobility Leuven | kris.vanherle@tmleuven.be

One of the key challenges for our future on a healthy planet is to create sustainable cities and communities with sustainable energy and mobility. Citizen science has a great potential to involve society in this process with creative ways and true-to-life issues. How can we produce scientific knowledge in the field of mobility and transport through citizen science (projects)? And, how can this knowledge and data affect policy making on transportation and mobility?

A new tool, the Parking Policy Audit PARKPAD

Jürgen Gies, *Martina Hertel and Robert Pressl

The Horizon 2020 project Park4SUMP aims to integrate the topic of parking management into Sustainable Urban Mobility Planning (SUMP). Mobility is a critical part for cities to reach their sustainability goals. Within Park4SUMP the tool PARKPAD is developed. Using proven quality assessment techniques it provides a process that helps cities to review their parking policies and to achieve consensus on potential improvements by developing an action plan.

Major tasks of PARKPAD:

- Collecting background information about the overall mobility and parking situation in the city.
- Establishing a 'stakeholder group' (consisting of elected political members of the council, city authorities such as planners from different departments (e.g. transport, health, economy, land use), citizens, NGOs).
- Two audit meetings to build consensus on the city's parking policy. The stakeholder group and the independent auditor create an agreed PARKPAD Action Plan comprising innovative, effective and locally acceptable package of measures.

Unlike traditional planning methodologies, PARKPAD actively includes citizens and stakeholders in a co-creation process taking into account that parking is more than a transport related matter. The focus is to move from an operational and reactive parking policy to a more strategic one. This includes objectives like increasing

health and well-being by a more fairly distribution of public space and reducing car travel while increasing walking and cycling or public transport. It will be explained why parking management provides excellent value for money. It is low cost, can be implemented quickly and generates revenue to pay for itself, whilst also supporting sustainable transport modes. It is suggested to earmark some of the revenues for measures to promote sustainable modes. The experience in 16 European Cities from 15 countries participating in Park4SUMP show that the biggest advantage of PARKPAD is the increased acceptance of what may be, at first glance, unpopular, but which are in fact rational and sustainable decisions.

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Citizen Science and Community Renewables: Overlooked Allies for SDGs and a Green Recovery
Daniel Wuebben

Citizen science (CS) democratizes knowledge; community renewable energy (CRE) democratizes power. Both CS and CRE challenge top-down infrastructures and help transform passive consumers into active co-creators. Furthermore, CS and CRE each advance SDGs such as 7) Affordable and Clean Energy; 11) Sustainable Cities and Communities, and 13) Climate Action. However, CS is rarely linked to CRE. The separation seems to apply across the broad field of energy research. In the recent issue of Sustainability, Filippo et al. (2020) show that of the 265 "energy efficiency" projects under the EU's Seventh Framework Programme, only 3% also featured "citizen science." Many ongoing projects address public acceptance of renewables, but only a handful focus on "community" input or control, and it seems only one—GRECO: Fostering a Next Generation of European Photovoltaic Society through Open Science—combines citizen science AND renewable energy. The split may be semantic. Research of public engagement and locally-owned energy sources like wind farms or rooftop solar as well as theories of "energy citizenship" are concomitant with CS, even if they do not explicitly mention it (Chilvers & Longhurst, 2016; Devine-Wright et al., 2017; Ryghaug et al., 2018; Walker & Devine-Wright, 2008). Furthermore, energy researchers are actively seeking ways to incorporate CS, especially citizen social science (Cappa et al., 2020; Hess & Sovacool, 2020; Sauermann et al., 2020). Yet stronger alliances must be forged to help spread the sustainable, decentralized, renewable energy infrastructures required to achieve various SDGs. What kinds of materials, methods, and spaces will allow CS to increase citizen engagement with CRE and the broader clean energy transition? To help answer this question, this presentation reviews CS and CRE projects in Spain, where policymakers are pushing for a green recovery and researchers are laying the groundwork for CS and CRE (Capellán-Pérez et al., 2018; Hewitt et al., 2017; Pellicer-Sifres, 2020; Sorman et al., 2020). It also shares results of 12 interviews with researchers, project managers, and public stakeholders who are engaging CS and/or CRE, including GRECO (Cristobal et al., 2019). The results support CS Track, an ongoing H2020 project that analyzes CS practices and creates a CS project database.

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Citizen science for citizen science in energy research
***Luisa Barbosa, Carlos del Cañizo, Ana Belen Cristobal and Gema Revuelta**

The deployment of clean and affordable energy (SDG7) is key towards a sustainable future and requires a strong participation of all societal actors. When considering solar energy, which is the only fully democratic type, citizens should be especially active protagonists of research and innovation. However, up to now, engagement efforts have considered civil society in their unique role as end-users. Therefore, researchers and innovators have mainly explored social acceptability of technologies and behavioural consumption patterns. There is a lack of enthusiasm or knowledge to engage citizens within this clean energy undertaking, valuing their skills to actually contribute to the scientific endeavour and decision-making. This is evident when looking at citizen science (CS) platforms: there is a clear gap of projects in energy research. The scarce initiatives include energy surveys, showcase of current challenges and breakthroughs and games for youngsters to design renewable energy systems. However, none of them yet connects to an ongoing research project nor to formulation of policies. We present a game changer experience from the EU-funded Project GRECO, that demonstrates how positive and necessary are the citizen-researcher symbiosis for energy research. First, with a CS initiative we collected old photovoltaic solar panels and co-created an ageing and reparation model with owners and installers in the Iberian Peninsula. Second, with a novel methodology, "Citizen Science for Citizen Science", we developed 'Generation Solar', a webapp that creates a database for decentralized solar installations. Our approach consists on a participatory process that includes i) an open call to researchers on how citizens can actively collaborate in their research; ii) an online hackathon with 62 participants from 15 countries to design a citizen science project; iii) a proposal evaluation and winner selection and iv) the development, launch and dissemination of the CS initiative to be adopted by the solar energy research community. The app has now more than 22MW of solar energy reported from 71 installations, and at least five research uses are foreseen for the data collected. With this experience, GRECO helps establish a paradigm for engagement in research into clean and affordable energies.

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Citizen engagement in the center of urban mobility planning
Balazs Nemeth and *Kris Vanherle

WeCount (Citizens Observing UrbaN Transport) is an H2020 project under the SwafS-programme which aims to empower citizens to take a leading role in the production of data, evidence and knowledge around mobility in their neighbourhoods, and at street level. The project employs participatory citizen science methods to co-create and use innovative low cost, automated, road traffic counting sensors (i.e. Telraam) and multi-stakeholder engagement mechanisms in 5 pilots in Madrid, Ljubljana, Dublin, Cardiff, and Leuven. These devices are unique in the sense that citizens play a key-role in the data-collection process, directly contributing to a participatory bottom-up approach in urban mobility planning. A pilot carried out in Belgium with around 800 devices placed in cities produced interesting data about changes in mobility patterns and trends during and after lockdown due to the coronavirus pandemic which helps local policy makers to give an effective answer to the unexpected situation in mobility planning. During the next months, the other pilots around Europe will launch involving at least 250-300 residents locally to monitor traffic in front of their windows and help collecting diverse data from these urban territories. Each pilot case concentrates on a different local issue to solve by crowdsourcing data, while Madrid addresses pressing traffic and environmental issues in the area, Cardiff will collect data to find solutions to improve air quality. By the time of the Conference, data will be collected from each pilot city which gives the opportunity to identify interesting patterns locally and differences between the cases in modal shares and traffic flows. Looking at the current situation in transport, data on travel behavior will be crucial in the next months to identify needs and transport shortages in urban areas. What we would like to show with a presentation about WeCount is how other cities could potentially use our experiences in their context to convince policy makers, thus solve mobility challenges effectively and sustainably with the help of citizen involvement.

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THEME 1.
ADDRESSING GLOBAL CHALLENGES
Citizen Science for sustainable education

Format: 10 minutes-presentation each keynote + 6 x 3-minute recorded presentations from the call + Q&A in the chat.

Session chairs:
Gitte Kragh | Centre for Science Studies and ScienceAtHome, Aarhus University | gitte@citizenscience.dk
Jacob F. Sherson | Director and Founder of ScienceAtHome, Aarhus University | sherson@phys.au.dk

This session will highlight how embedding citizen science and the SDGs into teaching curricula and education practices can empower people to understand, engage with and help solve local and global challenges, now and in the future. Contributions are invited from the wider citizen science and education communities for six-minute 'lightning talks' about innovative and impactful initiatives that focus on empowering young people to contribute to the SDGs through embedding citizen science into educational activities.

KEYNOTES

Playing games for science and the SDGs
Jacob F. Sherson

Short CV

Jacob Sherson is an internationally known quantum physicist with a passion for uncovering interdisciplinary connections between science, technology and society. He founded ScienceAtHome to create an online platform that democratizes science by turning research problems into engaging games that both capture novel solution approaches and educate citizens and students on science concepts. Jacob has launched a global effort to link citizen science with the core school curriculum in order to foster students' love of learning and curiosity for how the world works, while empowering them to contribute to cutting-edge research, through the Learn to Think Like a Scientist initiative.

Abstract

The lack of understanding of complex, contextual and nuanced skills like creativity, empathy, and cooperation, all commonly referred to as 21st century skills or soft skills, has been identified as a fundamental roadblock in reaching both the Sustainable Development Goals like 'Quality Education' and 'Decent Work and Economic Growth' and more generally, the efficient solution of any complex multi-stakeholder, socio-scientific problem in relation to each of the SDG subgoals. This talk discusses how ScienceAtHome provides innovative and scal-

able digital methodologies to address some of these roadblocks in relation to creativity and cooperation in combination with a democratization of science through enabling students and the public to participate in online science games and interactive simulations. Concretely we will present i) a suite of behavioral economics games to create new knowledge and foster deeper awareness around the social dilemmas associated with various SDGs; ii) a set of simulation tools aimed at both giving students a deeper understanding of mechanisms such as climate change models and containment policies related to the Covid-19 pandemic and at the same time being a public democracy tool by collecting attitudes to both best and worst case scenarios; and iii) a digital collaborative tool, the Citizen Science Notebook, allowing remote students engaging in a knowledge creation process to remotely co-create and synthesize insights, actions and recommendations. Finally, we tie these approaches together through our Research-Enabling Game-Based Education (ReGAME) strategy and provide examples of use of ReGAME. ReGAME uses games and tools to relate research challenges to core curricula to cultivate a love of learning and curiosity for how the world works among students. Using games motivates students at all levels by providing perspective and a less formal introduction to the topics, thus making normally challenging topics, such as quantum physics, accessible to most students.

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Citizen science for the SDGs: the Crowd4SDG project
François Grey

Short CV

I am a physicist with a background in nanotechnology, and a passion for citizen science. At the University of Geneva, I run Citizen Cyberlab, a partnership with CERN and the UN Institute for Training and Research where we develop and study new forms of public participation in research.

Abstract

Launched in May 2020, the EC Crowd4SDG project is exploring how citizen science can track progress towards the Sustainable Development Goals (SDGs) and how grassroots innovation can help achieve such progress. Crowd4SDG focuses on how crowdsourcing, in conjunction with artificial intelligence and social media analysis, can be used to monitor climate impacts and achieve climate resilience. On 7 September, Crowd4SDG launched the #Open17Water challenge for high-school, undergraduate and master students, ages 16-26. This involves online and in-person coaching of young innovators over a period of up to six months, to tackle challenges related to Urban Water Resilience using crowdsourcing and citizen science. In this talk, I will brief about how citizen science, through this student coaching programme, aims to support the SDGs. The Crowd4SDG partners are: University of Geneva, the European Organization for Nuclear Research (CERN), the Spanish National Research Council (CSIC), Politecnico di Milano, the United Nations Institute for Training and Research (UNITAR) and University of Paris.

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Towards a citizen science of sustainable education
François Taddei

Short CV

François Taddei is the founder and director of the Centre de Recherches Interdisciplinaires, CRI, in Paris. He is a researcher in evolutionary systems biology that received awards such as the Inserm award for fundamental research, the Bettencourt award for Life sciences and the European Young Investigator award. He has created bachelor, master & PhD programs in the Center for Research and Interdisciplinary in Paris in order to empower the new generations of change makers by training them through research at the frontiers of disciplines.

Abstract

We know that UN SD Goal 4 is to "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". It includes Target 4.7: "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development."

Target 4.7 may be the most central target as we need the next generation to be inspired and empowered to be able to learn to contribute to meet all the other 168 targets of the SDG. But we still lack a citizen science of target 4.7. This can be done by inviting learners and teachers to collectively define what learning to be a global citizen means in the 21st century and invite them to contribute to learning collectives at all scales including a learning planet. A planet where learners will be invited to celebrate their most relevant learning about the best ways to care for oneself, others and the planet on January 24, the UN international day of education. Participating in the local version of a learning planet festival, learners can not only celebrate and document what they learn but the people that help them and can be invited to reflect on what they want to learn next and then connect with other members of their learning communities that can help them face our personal local and global challenges.

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Integrating Citizen Science into Global Goals Curriculum for Youth Ages 8-17
Carol O'Donnell

Short CV

Dr. Carol O'Donnell directs the Smithsonian Science Education Center, dedicated to transforming K-12 Education through Science™ in collaboration with communities across the globe. In this role, Carol serves on

numerous boards and committees including the InterAcademy Partnership Science Education Global Council, a network of national academies of sciences, engineering, and medicine, and the Broadband Commission for School Connectivity Working Group on School Engagement. She is also on the part-time faculty of the Physics Department at George Washington University, where she earned her doctorate.

Abstract

In this session, we discuss how we integrated citizen science into Smithsonian Science for Global Goals (SSfGG) – a series of free online Community Research Guides for youth ages 8-17, which contain carefully sequenced transdisciplinary science lessons interwoven with education for sustainable development. Through the development of a series of modules (e.g., Mosquito!, Food!, COVID-19!, Biodiversity!, Sustainable Communities!), the Smithsonian Science Education Center began to use the SDGs as a framework for engaging youth in discovering, understanding, and acting on the science of global issues faced by their communities. However, one of the challenges with abstract global goals is how to apply them concretely in local settings. This session discusses how we integrated citizen science into the SSfGG program, designed to incorporate place-specific data and community perspectives to ensure local relevance to bring about transformational impact. We argue that it is not enough to teach students that the SDGs exist. Instead we are seeking new ways for learners ages 8-17 around the world to embody the SDGs in their communities every day. In other words, the goal of the SSfGG project is to not only teach students the science behind these socio-scientific issues, but to drive students' capabilities to act to use this science to do social good in their communities and the world. But, to drive students to act, we need to assess their propensity for changing their own behaviors, or micro-actions. This session discusses how the Smithsonian is working with Aarhus University to embed "extreme citizen science" into SSfGG through digital citizen science tools and games based on behavioral economics developed by Dr. Jacob Sherson and his team at ScienceAtHome. We also discuss how we are using their Citizen Science Notebook as a tool for students to move up the "ladders of participation" in citizen science from "traditional citizen science" to "extreme citizen science," which "takes into account local needs, practices, and culture and works with broad networks of people to design and build new devices and knowledge creation processes that can transform the world" (University College London, 2019).

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PRESENTATIONS

Activating students for climate change adaptation by collecting and communicating data of extreme weather events

***Thomas Kox, Martin Göber, Henning Rust, Elisabeth Freundl, Anne von Streit and Matthias Garschagen**

Citizens as voluntary weather observers have long contributed to weather and climate science. The density of the professional observation network is enriched by lay observations of weather phenomena and their impacts. Some statements about the impact of climate change on the environment and people would not be possible without them. A better public understanding is also particularly interesting in order to build up decision-relevant knowledge about climate change, as citizens not only gain key scientific insights, but also increase their understanding of the topic and gain a growing interest in the research process. In the KARE-CS project funded by the German BMBF a lay weather network has been set up together with schoolchildren in the Bavarian Oberland south of Munich. The students measure weather data such as temperature and precipitation in their direct environment with self-built weather stations out of a 3D-printer. They also report weather impacts such as observed damages or their own concernment. These data are evaluated in workshops involving the students, their teachers, lokal partners and scientists. KARE-CS focuses on upper secondary school students as participants. In the sense of the Education for Sustainable Development (UNESCO), the participation of schools leads to a development of competences among teachers and multipliers and to a strengthening and mobilisation of the youth, particularly in terms of climate change adaptation, understanding natural hazards and risks and in taking personal precautions. KARE-CS aims to foster the dialogue of science and society and to communicate research and scientific content to target groups outside science in a generally understandable, dialogue-oriented way, as stated in the BMBF's policy paper on science communication. Using the networks of the participating partners, the results of the project will be directly integrated into ongoing processes of various national and international scientific bodies and agreements - in particular the Hans Ertel Centre for Weather Research of the German Weather Service, the High Impact Weather Programme of the World Meteorological Organisation, for the implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR), the Sustainable Development Goals (primarily SDG 11) and the Bavarian Climate Council.

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Citizen Science as part of the elementary school curriculum: case-study of technical day on the topic of noise and health

***David Kocman, Tjaša Števanec, Rok Novak and Natalija Kranjec**

This contribution summarises lessons learned conducting citizen science activities within the CitieS-Health H2020 project (https://citieshealth.eu/) on the topic of noise exposure and health at elementary school in Ljubljana, Slovenia, organised in a form of a School Tech-Day Event (STDE) as part of the school's curriculum. A total of 70 students from three second grades (age 7-8), three of their teachers and four researchers participated. The STDE lasted

approximately four school hours and was organised in line with the methodological framework of the CitieS-Health project in the following sequence and phases, respectively. Within the identification phase, concerns and interests of pupils regarding noise and health were identified using a pre-event questionnaire and then in dialog with pupils, respective selected topics translated into research questions. Next, within the design phase, data collection protocol was defined in a co-design with pupils, the process that comprised hypothesis setting, and selection and familiarization of pupils with data collection approach and tools, respectively. Deployment phase followed during which pupils collected and analysed data. Results obtained within a separate group of pupils during the deployment phase were then presented in a form of a "mini-conference", while knowledge gained during the STDE was finally evaluated by an online quiz. The whole chain of these activities, including the tools used, will be reported and critically evaluated. To this end, selected components of the citizen science evaluation framework as suggested by Kieslinger et al. (2018) were adopted and tailored according to specifics of the activities conducted.

Reference:

Kieslinger, B., Schaefer, T., Heigl, F., Dörler, D., Richter, A., Bonn, A., 2018. Evaluating citizen science – Towards an open framework. pp. 81–98.

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Does environmental citizen science in schools provide opportunities for pupils to engage in ecological citizenship?
Claire Ramjan

Sustainable Development Goal 4.7 aims to enable all learners to participate in sustainable development education, including global citizenship and environmental education. Existing research suggests that citizen science can impact on 'positive actions for the environment' (Cooper et al 2007), 'STEM career motivation' (Hiller & Kitsantas, 2014) and the 'environmental science agency' of young participants. While some studies have looked to identify specific learning outcomes (Phillips et al 2018) fewer studies have made links to ecological or environmental citizenship outcomes. Those studies that have attended to environmental citizenship related outcomes have considered citizen science experiences in youth settings outside of formal education (Ballard et al, 2016). This research looks to identify if environmental citizenship outcomes are demonstrated by young people who have engaged in citizen science within their formal schooling, as the non-voluntary nature of participation in formal schooling may result in different experiences and outcomes (Harlin et al, 2018). Furthermore, the project sets out to discover if there are signs of an emergent ecological citizenship during the citizen science experience itself. The research is part of a PhD research project, therefore analysis is ongoing, however, preliminary analysis has generated findings relating to signs of emergent citizenship, citizenship related discussions and behaviours. Connections to capabilities with particular relevance to 'living in relation to plants, animals and the natural world' (Robeyns, 2017) were identified both in pupil behaviours and in their discussions. This presentation will outline the preliminary findings of the participant observations, questionnaires and focus group discussions. It will draw out the key initial findings from each approach, particularly focusing on the affective and cognitive domain impacts as described by pupils in the questionnaire tasks. Links will be made to the relational nature of participating in environmental citizen science in an outdoor, often remote, setting and the sensory experience that the participant observations brought into view. Situational maps will be presented that bring out the complexities of the pupils' experience and exemplify the rich and deep analysis that includes the human and non-human actors present in, and impacting upon, the intention of the research (Clarke, 2003).

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Nature around the Corner: involving underprivileged children in citizen science
***Daniëlle Meuleman and Yuri Matteman**

Nature around the Corner is a project for children (8-12 years) living in disadvantaged and/or urbanised neighbourhoods, to explore nature that is available in their neighbourhood. Many of those children do not have sufficient space and opportunities to explore nature on their own. In this project they can discover and pursue their passion for nature and science, and get a high quality education and acquire competences connected to science, nature, environment and sustainable development (SDG4). In doing so, we enhance their scientific literacy, preparing them for participation in citizen science projects. For instance, in 2019 and 2020, the children participated in the Dutch National Bird Count and the Dutch National Bee Count. Nature around the Corner aims for children – supported by community members and stakeholders – to take positive actions towards the realisation of the Sustainable Development Goals on environment and nature: i.e. Responsible Consumption & Production (SDG12); Climate Action (SDG13); Life Below Water (SDG14); and Life on Land (SDG15), simultaneously contributing to the horizontal priority 'Environmental and climate goals'. Climate change requires direct action, from every one of us. However, people who do not engage with nature at a young age, are less likely to engage in nature, climate and sustainability at a later age. Furthermore, Nature around the Corner addresses social inclusion by targeting children from disadvantaged and/or urbanised areas and reducing the disparities concerning access and engagement with non-formal education. We're advancing equality (SDG 10) by having community stakeholders involved in developing and implementing structural Nature around the Corner activities. By bringing easily accessible nature activities to the neighbourhood, everyone can join. In this session we will show how we stimulate this group of children to explore nature and science, with emphasis on our efforts to involve them in citizen science projects.

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Empowering children to learn about, connect with, and care for nature through participation in the citizen science project MammalWeb

***Samantha Mason and Philip Stephens**

For children and teenagers, participating in ecological recording as part of a citizen science project may open up new opportunities to learn about, connect with, and care for the natural world around them. MammalWeb is a project that invites citizen scientists from across the UK to upload and classify images from personal or borrowed camera traps. Throughout 2019, over 3,000 primary school children from 50 schools across northeast England participated in MammalWeb. Schools were given a camera trap to use for one month and received either a workshop for pupils, or a training session for teachers. Over the course of the project, schools contributed over 2,000 photo sequences from camera traps and submitted over 13,000 classifications for their own and other photo sequences on MammalWeb. These records add to existing national mammal monitoring efforts that serve to inform conservation management and tackle environmental challenges. The impact from this project was more than just the ecological records gained however. By using questionnaires from before and after participation in the project, we showed that children increased their knowledge of UK wildlife, were more connected to nature, and had more pro-environmental views and attitudes after participation in MammalWeb. Teachers also reported being inspired to incorporate more outdoor learning into their teaching going forward, and some schools have invested in buying their own camera traps to continue monitoring their local wildlife. The data collected, along with the changes in knowledge and attitudes seen in participants, is a small but vital step forward in contributing to multiple sustainable development goals (SDGs). The project directly and immediately helped to tackle SDGs 4 and 15: quality education and life on land. Furthermore, by empowering project participants to understand and help solve environmental challenges, the project had wide and long-term impacts on many other SDGs such as 12, 13 and 14: responsible consumption and production, climate action and life below water. Overall, this study demonstrated the great potential for citizen science projects to be integrated into teaching to bring multiple benefits and help tackle global challenges, both now and in the future.

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Mobile device data collection from Malawian macadamia farmers for agricultural research and teaching in the context of Sustainable Development Goals

***Yoseph Araya, Will Rawes, Emmanuel Zuza and Andrew Emmott**

Ensuring food security is one of the UN's primary Sustainable Development Goals (SDG2). Achieving it would require adopting innovative agricultural practices. One such approach increasingly being undertaken in sub-Saharan Africa is agroforestry, a farming system where trees are grown alongside crops – thereby supporting the growth of the crop and diversifying diet and produce. Moreover agroforestry is considered to contribute to other SDG's such as climate resilience (SDG13) and halting environmental degradation (SDG15). Macadamia is an important agroforestry tree crop in Malawi, both for income generation and as a supplement to maize based diets. However, yields from macadamia provenances are still very low especially at smallholder farmer level. Understanding factors influencing macadamia yields is vital in order to improve them. Collecting data at smallholder level is essential to obtain accurate and relevant information to assist farmers in making informed decisions about the provenances they grow and management practices. Neno Macadamia Trust and Highlands Macadamia Cooperative Limited have empowered Lead Farmers to become enumerators to collect the provenance data using mobile phones. Farmers need to own up the research and see its benefits. Additionally, the data provides students (currently UK distance education students at Open University) into direct contact with pertinent global challenges in context of SDG's as well as first-hand experience of handling raw data. They analyse and research on how macadamia provenances, their yield and local environmental factors interact. In this presentation, we report successes and challenges from 3 survey seasons undertaken in engaging farmers, integrating technology in the field and teaching student's data scrutiny.

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THEME 1.
ADDRESSING GLOBAL CHALLENGES

Responsible food consumption and production through Citizen Science

Format: Keynote + 5-minute speed talk on the basis of posters + discussion.

Session chairs:
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Anett Richter | Johann Heinrich von Thünen Institute | anett.richter@thuenen.de

While food consumption and its sustainability is in the hands of consumers, food production in Europe is largely controlled by a few global agricultural companies. The challenge of initiating and establishing responsible food consumption patterns is therefore a significant one. In this session, we will discuss the current relevance of and opportunities for citizen science in research on food consumption and production.

KEYNOTE

The power of Citizen Science for Policy: examples and experiences in environmental citizen science and policy
Anett Richter

Short CV: Anett leads the research group "Citizen Science" at the Thünen Institute of Biodiversity and investigates topics associated with citizen science, agroecology and biodiversity. She aims to better understand the structures and functions of citizen science and gathers empirical evidence to prove citizen science as a research field beyond a tool for data acquisition. Anett is passionate about expanding citizen science as a concept and works with colleagues to assess synergies with education for sustainable development, environmental policy and agro-ecology.
Abstract: In her keynote Anett Richter, from the Thünen Institute for Biodiversity, will provide a snapshot of few examples from environmental citizen science and will showcase how these findings informed environmental policy. She will briefly highlight some conditions to ensure this uptake and will open the session by formulating the session's aim and the expected outcomes of this session.

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PRESENTATIONS

The impact of citizen science towards sustainable production of aromatic plants
Ishtiaq Arif and *Jessica Amprako

Spices and herbs are annual and perennial aromatic plants grown for their stems, seeds, bark, pod and flowers that impart flavour or colour. The world production of spices and herbs amounts to about 6 million tons making it a very important product. In Bangladesh and Pakistan, there is high demand and growth of spices and herbs such as turmeric and in areas of Shariatpur and Karachi. In these countries, spices are of great economic value and contribute immensely to their national economies. Previously, many studies have focused on issues and challenges in cultivation practices, labour, technology and marketing of quality spices to safeguard the health and safety of consumers, increase agricultural productivity and sustain the environment. However, a comprehensive account of the adoption of sustainable production practices and biodynamic agriculture as an option which increases crop productivity is still an emerging area of study. Therefore, we aim to study the implementation of citizen science as a tool for the development of sustainable production of spices in Bangladesh and Pakistan. To achieve this, we will (1) identify the indigenous agricultural practices used for spice and herb production and their potential of increasing crop productivity, and (2) examine the sustainability of agricultural citizen science study in spice and herbs production with local smallholder farmers. Adopting a qualitative content analysis approach, we will compare the crop productivity of farmers that will adopt organic farming and biodynamic practices against the indigenous agricultural practices. Our results will reveal the benefits, challenges and limitations of agricultural citizen science study in spice and herb production in Bangladesh and Pakistan. The findings of the study will contribute to sustainable production of spices and herbs and will safeguard the knowledge of indigenous agricultural practices of smallholder spice and herb farmers.

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Citizen science and the food system: opportunities for reducing loss and waste
Sarah West and *Rachel Pateman

Food loss and food waste are urgent global problems relating to environmental and social challenges including biodiversity loss, climate change, health and malnutrition. The Food and Agriculture Organisation have estimated that if food waste were a country, it would be the third largest emitter of GHG in the world. Food waste reduction targets have been set, including Sustainable Development Goal (SDG) 12.3, which aims to halve per capita food waste at retail and consumer levels globally by 2030, as well as reduce food losses along production and supply chains. Citizen science can play a role in tackling the problem of food waste and food loss. We present the results of an exercise where we explored opportunities for using citizen science to answer 26 priority research questions identified by experts as being critical to achieving SDG12.3. We give examples of a) how citizen science can be used to quantify food loss and waste across different areas of the food system, and b) how citizen science can be used to understand causes of food loss and waste and help develop solutions. Through our examples, we demonstrate the value of using

citizen science approaches to go beyond data collection to being an intervention to bring about change from the individual behaviour level through to policy-makers. We demonstrate the need to bring together all actors in the food system in citizen science projects in order to build shared understanding that will ultimately lead to change.

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Citizen engagement in biotechnology innovation – the need for research and the role of ethics

***Siri Carson, Bjørn Myskja and Anne Myhr**

The promised disruptive potential of genome editing for producing novel agri- and aquaculture products with enhanced qualities has refocused the discussion on non-safety assessments of biotechnological inventions. We will present arguments that such assessments are feasible and justified. Such assessments generally involve the use of stakeholder and citizen engagement in handling the normative issues at stake. This is done through different forms of surveys, focus group interviews, dialogues, consultations and other engagement methods. Here we present two recent Norwegian surveys, focusing on similarities and differences. The intention behind both surveys was to identify perspectives on the use of genome-editing in animals and plants to be used within agri- and aquaculture. One used future possible cases as examples, while the other used present cases. Through an analysis of these two recent surveys we will show that, although such approaches are valuable in many respects, they fall short when it comes to providing a normative basis for non-safety assessments. The knowledge basis underlying the engagement processes tends to be simplified and biased, and the conclusions and suggestions drawn from the processes tend to be uninformed by normative research. We will discuss how to amend these shortcomings by enhancing the research-based framing for such processes, from the designing of them, via the analysis of data, to the dissemination stages. In highly contested areas of research such as genome-editing in agri- and aquaculture, citizen engagement approaches should be based in transparent scientific and normative analyses. We will furthermore argue that exploration and implementation of non-safety assessments in regulation of genome-editing technologies needs a diversity of approaches, including knowledge-based stakeholder and citizen engagements.

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ReThinking Food: empowering citizens in societal change processes

***Danielle Wilde, Caroline Guinita Abel, Anna Lena Huppe and Kathrine Sekkelund Munch**

We must urgently transform the human food system. This transformation must be systemic, but also play out in people's everyday practices, because how we eat reflects culture and tradition, habits and desires, as well as available possibilities and nutritional needs. ReThinking Food takes a co-creative approach to citizen science to identify viable pathways to such societal transformation. We take the WWF and Knorrs 'Future 50 Foods Report' as our starting point, and work with diverse Danish households to determine how to connect daily food and eating practices with local, regional and international agendas of sustainability. In doing so, we ask: What is required for top-down reports to be effective in leading to changes in practice? and How might citizens be empowered to drive both top-down and bottom-up societal change? Our approach foregrounds the value of situated knowledge, the expertise that arises from personal experience, and the importance of inclusion. It extends existing approaches to citizen science to be more inclusive and open. It seeks to maximize the social impact of citizen science for people who may not otherwise have a voice in societal change. Further, focusing the inquiry on food enables us to link a pressing global issue with everyday, situated practice. The research thus couples the idea of becoming an agent of transformational change with a personally relevant, locally situated, globally impactful everyday activity. It includes people as key actors in the transformation process, as it investigates how to effectively upstream involvement of (often marginalised) people into the conception, development, deployment—and thus social impact—of science. A central question is how co-creative citizen science, drawing on participatory research through design, can productively transform citizen science into personal and social impact that together create social, economic and environmental value not only for the people involved in the study, but for society at large through expanding the possibilities of citizen science. The approach challenges dominant models of citizen science by developing broader, more inclusive and more personal community aspects. It moves the conversation beyond important issues of food system transformation, to no less important concerns for personal empowerment.

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The Food Waste Experiment – a novel method for calculating food waste

Fredrik Brouneus, *Roberto Rufo Gonzalez, Sverker Johansson and Björn Hedin

Our food is responsible for over one-third of human-caused climate emissions. At the same time, almost one-third of food produced globally is thrown away. In November 2020, researchers will be testing a new way to reduce food waste in Swedish schools: by providing more information and feedback to pupils. The Food Waste Experiment is a national project, in which pupils all over Sweden will use an app to find out how much food they are throwing away. Before lunch, they will receive information about that day's menu being served in the school dining hall, the nutritional content of the various dishes and their climate footprint. The information is retrieved from the

world's largest database on factors related to food and environmental impact, health and justice, developed by the company Consupedia in collaboration with researchers at Dalarna University and KTH Royal Institute of Technology in Sweden. The pupils will photograph their plates before and after eating, to let the app calculate how much is being thrown away. This way, they will be able to see exactly how their food choices and food waste are affecting the climate. The researchers will test the accuracy of this new way of measuring food waste, and also investigate whether it is possible to create virtuous circles in how food is dealt with. If pupils are more aware of how their food is affecting the climate, health and the environment, will this lead to more thoughtful choices in the dining hall? If school kitchens get better information about what food the pupils like and dislike, can the menus be adapted to better suit both the needs and the tastes of the pupils? When the kitchens can make more tailored orders from the wholesalers, will this result in reduced amounts of waste both in kitchens and at wholesalers? The Food Waste Experiment ('Svinnkollen' in Swedish) is being carried out between 9 and 27 November 2020 and is a collaboration between Dalarna University, KTH Royal Institute of Technology, the company Consupedia and VA (Public & Science). The project is being funded by the Swedish Energy Agency and Consupedia.

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THEME 1.
ADDRESSING GLOBAL CHALLENGES
Citizens in biodiversity monitoring

Format: 5 minutes of introduction, 8-minute presentation + 2-minutes Q&A each presentation followed by a 25-minute long discussion.

Session chairs:
Nike Sommerwerk | Museum für Naturkunde Berlin | Nike.Sommerwerk@mfn.berlin
Jörg Freyhof | Museum für Naturkunde Berlin | Joerg.Freyhof@mfn.berlin
Martina Lutz | Museum für Naturkunde Berlin | Martina.Lutz@mfn.berlin

Sustainable life on earth requires protection and sustainable management. These need sound knowledge. Here, monitoring is an important tool and essential to reach environmental goals. In this session, we will focus on the integration of citizen research into biodiversity monitoring and thus its current and possible future contribution to national and international reporting obligations. We will also address how to enhance citizen scientists' access to infrastructure, resources, literature, training, laboratories, as well as coordination services. This will include issues of data storage, data quality assurance and maintenance, method development, metadata creation, planning of data collection and data visualisation.

Citizens' engagement in biodiversity monitoring: the "Invasive Alien Species in Europe" mobile App

***Eugenio Gervasini, Ana Cristina Cardoso, Celia Lopez Canizares, Irena Mitton, Fabiano Spinelli, Sven Schade and Konstantinos Tsiamis**

Alien Species are species introduced into places outside their natural environment. Some of these, the Invasive Alien Species (IAS) may severely affect biodiversity, the economy and people's health, and undermine progress towards achieving the UN Sustainable Development Goals. Under the European Union (EU) Regulation 1143/2014 on IAS (Regulation on IAS), EU Member States must prevent the introduction and spread of IAS of Union concern, enforce effective early detection and rapid eradication mechanisms on new introductions, and adopt management measures for species already widely spread. Tackling IAS requires accurate, detailed, and timely information on their occurrences and distribution. Citizen Science (CS), by expanding the spatial and temporal scale of species records, has been recognised as a complement to management efforts against IAS and as a key need for large-scale biodiversity conservation. Citizens can play an active role in IAS detection and management, supporting EU Member States' Competent Authorities in addressing biological invasions or implementing the Regulation on IAS. The development of new technologies,

such as smartphone applications (apps) can support the generation of georeferenced records of IAS by citizens. Once validated, these can complement professional observation schemes with useful data for early warning, rapid response programs and management schemes. The smartphone application "Invasive Alien Species in Europe", with an underlying data management and validation infrastructure, allows users to report the presence of the 66 species listed as IAS of Union concern. Data quality assurance and integration mechanisms into place allow the uptake of information into existing official systems, e.g. the European Alien Invasive Species Network (EASIN) - the official information system supporting the implementation of the EU Regulation on IAS. From EASIN the information can become accessible to the relevant policy-makers at EU level. This talk will present our app and highlight remaining challenges, in particular obstacles to seamlessly data sharing and integration, data validation, and citizen engagement.

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Engaging citizens will preserve butterflies in Europe: lessons learnt from the ABLE project

***Cristina Gonzalez Sevilleja, Nigel Bourn, Sue Collins, Josef Settele, Chris van Swaay, Irma Wynhoff, Martin Warren and David B. Roy**

Major declines in insect numbers and pollination services are a global issue. To assess the actual trends, long-term monitoring programmes are necessary, but still scarce. The monitoring is challenging as insects are one of the groups with highest species richness in the world. Butterflies offer a good opportunity as they are popular among the public, easily identifiable, and highly sensitive to environmental change. These characteristics make butterflies valuable bioindicators, providing a great opportunity for citizens scientists to monitor and conserve them. In Europe, butterflies are already regularly monitored by citizens taking part in national monitoring schemes. More than 17 countries are partners of the European Butterfly Monitoring Scheme (eBMS) and are using standardised methods for counting butterflies along fixed routes (transects). The Butterfly Monitoring Schemes (BMS) have been expanded rapidly over the last years in many countries, yet some countries still lack a formal scheme. For that reason, the EU Pilot project, Assessing ButterfLies in Europe (ABLE) was initiated in 2018. Key aspects of the ABLE project are to work with partners in Member States and help supply citizens with training on butterfly monitoring methodology; access to infrastructures that facilitate the monitoring (identification guides, website, and recording App for smartphones); and the creation of national level coordination. With this facilities, the ABLE project support the creation of new BMS in countries where financial support is not available. This will demonstrate the value of monitoring butterflies to national authorities and help to achieve the maintenance of eBMS schemes in the future. The new EU Biodiversity Strategy 2030 underlines the crucial importance of biodiversity monitoring and indicators to underpin effective interventions to reverse past losses and restore biodiversity. The eBMS data is used to develop butterfly abundance indicators and calculate trends at the EU level that help to evaluate the implementation of EU nature and agriculture policies. Lessons learned from working closely with volunteers, partner organisations and Member States to engender their support for butterfly monitoring through citizen science will be presented. Citizen science can play a crucial role in this endeavour and help point the way for global biodiversity recovery.

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Natura Alert: Monitoring biodiversity threats using citizen science

Sofia Capellan, Ivan Ramirez, Linda See, Anto Subash, *Inian Moorthy, Steffen Fritz, Octavio Infante and Lalu Abdi Wirastami

Since the late 1970s, the BirdLife Partnership has been working collectively to identify, document and protect places on the Earth with the greatest significance for the conservation of the world's birds. As a result, over 13,000 Important Bird and Biodiversity Areas (IBAs) have been identified. However, we lack comprehensive monitoring of the condition of these sites, with an increasing number of IBAs under threat from damaging development – the majority of which appears to be poorly planned and does not take environmental values into account. To address this problem, Natura Alert has been developed within the Horizon 2020-funded LandSense Citizen Observatory. Natura Alert is a mobile app and web portal that allows users to pinpoint the location of threats to biodiversity and habitat changes, to prevent the further damage or loss to our biodiversity. We are particularly interested in threats that are occurring inside IBAs, Key Biodiversity Areas (KBAs) and Natura 2000 sites in the European Union, although submitting records in other areas is also possible. Information on the condition of these sites, the threats to them, the conservation measures in place and the temporal dynamics are essential to set priorities, hold governments accountable and inform policies and decision-makers. Volunteers can share their observations with the wider community and help to map the state of our most valuable sites around the world. Natura Alert is being tested in Spain and Indonesia, thanks to the volunteer networks of two BirdLife partners: SEO/BirdLife and Burung. While the Spanish volunteers are focusing on threats to birds and habitats within IBAs and Natura 2000 sites, the Indonesian communities are validating alerts from satellite-image analysis for forest change on Flores island. Citizen observations trigger real-time alerts to national and regional IBA/KBA coordinators, who check the data meets quality standards and produce regional monitoring assessments that help monitor the indicators of the Sustainable Development Goals (SDGs) and the Convention on Biological Diversity (CBD). Such citizen-powered data benefits researchers and practitioners, as well as institutions and stakeholders from the private

sector focused on evidence-driven decision via the Integrated Biodiversity Assessment Tool (IBAT).

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THEME 1.
ADDRESSING GLOBAL CHALLENGES
Lightning talks

Format: 5-minute talk + 2-minute discussion each.

Session chairs:
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Silke Voigt-Heucke | Museum für Naturkunde Berlin | Kim.Mortega@mfn.berlin

Lightning talks are short presentations on a particular theme. In this session, projects with significant citizen science activities and achievements will have the opportunity to present their work in relation to other themes relating to the SDGs, such as disaster response, climate change, inequalities, and responsible production and consumption.

REINFORCE (REsearch INfrastructures FOR Citizens in Europe) presented under the lens of SDG4, 5, 10, 13, 14, 15 and SDG17.
***Stavros Katsanevas and Francesca Spagnuolo**

EU-funded SWAFS REINFORCE project's main goal is the development of new knowledge in Science with the support of citizens in a two way process. It aims to develop in particular a multi-sensorial apprehension of the many faceted definitions of cosmos (Universe, Earth, Society and Human), explore the potential of frontier citizen science for inclusion and diversity, also targeting visually impaired, confined or senior citizens ; go beyond established traditional disciplinary frontiers of the modes of apprehension of reality, exploring the interface between Art and Science and develop methods of critical thinking in a world moving towards increased digital connectivity and remote employment. REINFORCE also considers the gender dimension of science by equally recognizing the impact of male and female role models in the development of frontier science. The frontier research conducted at and around large infrastructures of science, in particular the European Gravitational Observatory EGO/Virgo for gravitational-wave science, CERN for subatomic physics, the Mediterranean deep sea neutrino observatory KM3Net as well the many biological, geoscience, and environmental applications developed in these large infrastructures for in-depth study, risk prevention and disaster early warning. REINFORCE also addresses the large field of applications developing around the use of the cosmic rays for the radiography of geostructures (eg volcanoes), atmospheric studies (cloud formation) and civil infrastructures (e.g. archaeology or disaster inspection). Methodologically, REINFORCE develops a participatory process, amalgam of "contributory" and "co-created" citizen science. A key feature of its methodology will be the exploration of multi-modal apprehensions of reality (image, sound,…). The multi-sensorial aspect of REINFORCE, that is the sonification effort, is not promot-

ed only as a means of increasing inclusion, but in fact, augments the cognitive capabilities of the researchers, permitting alternative and in some cases better methods of recognition of signal over background. REINFORCE uses two major tools: a) the platform Zooniverse (Citizen Science Platform with more than 1,000,000 volunteers, www.zooniverse.org) and new sonification software (SonoUno, https://pypi.org/project/sonoUno/). As a final deliverable, the project will create a policy roadmap, as paradigm for other large research infrastructures wanting to implement citizen science projects in the EU and beyond.

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SOLIDUS-Solidarity in European societies: empowerment, social justice and citizenship

***Marta Soler Gallart, Mimar Ramis-Salas and Regina Gairal-Casadó**

The project draws on identifying the relevant drivers and barriers in relation to the spatial dimension of solidarity. Particularly it provided results of five Spanish case studies of successful acts, which are proven to overcome geographical and social inequalities while also enhancing spatial and intergroup solidarity in relation to housing, education, employment, health and civic engagement. The H2020 SOLIDUS project -Solidarity in European societies: empowerment, social justice and citizenship- answers the small or medium-scale focused research projects call for 'European societies after the crisis' (Euro-3-2014). It falls within the broader objectives of the H2020 'Europe in a changing world: inclusive, innovative and reflective societies' work programme, under the general call 'Overcoming the Crisis: New Ideas, Strategies and Governance Structures for Europe'. In this context, the project SOLIDUS analysed the acts of solidarity developed across Europe. It also explores to what extent they respond to dialogic and inclusive processes and more importantly, the related outcomes and policy developments for overcoming the consequences of the world economic crisis; while reducing social inequalities, strengthening social cohesion and increasing well-being. Conducted under the communicative methodology, this analysis also shows the opportunities for scaling up.

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Citizen-enhanced climate actions – a Pan-European perspective

Dobrivoje Lale Eric, *Norbert Steinhaus, Kate Sposob, Alexander Gerber and Joanna Morawska-Jancelewicz

The climate is currently unfairly shadowed by another (un)expected global affair, yet its manifestations and influence are nevertheless fiercely experienced across the globe. However, if we can look at it as an opportunity for translating a message – set around similarities and basically very same nature of causes of climate changes and pandemic burst – we may be able to initiate wider citizen engagement by empowering critical understanding of processes in nature and humans' interference and contribution to their consequences. The H2020 project TeRRIFICA (2019-2022) was conceived around the idea that a bottom-up approach, the integration of all relevant stakeholders and all related aspects along climate policy and climate action, and the direct involvement of citizens in all phases of creation of climate actions are central and necessary. In a system defined by the RRI policy, the Sustainable Development Goals and climate adaptation and mitigation strategies, TeRRIFICA operates in six European regions with very distinct challenges, in and outside the EU. As an action research project, with a territorial perspective in mind, it brings together a full diapason of different types of organisations from Barcelona and Belgrade, Brittany and Minsk, Poznan and the Oldenburger Münsterland: universities, a public entity and CSOs. The objectives of the proposed contribution are to showcase TeRRIFICA's unique approach and developed methodology, present insights into six (in)dependent pilot regions and motivate and encourage other partners and regions to join the initiative or test its applicability in their respective environments. Equally important, the contribution and TeRRIFICA's participation at the conference may enable the consortium to exchange gained knowledge with peer projects and initiatives, and to consult or apply their methods and strategies. The speakers will present the project's structure and initial set of outcomes; findings and achievements of three (out of six) pilot regions; and the measures to control and validate the process and methodology. Further activities will be announced to induce collaborative activities with the conference participants. Additional to the proposed structure, the project intends to invite and involve two policy representatives from its pilot regions (external partners), which could unfortunately not be confirmed at this moment.

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"OMG, Earthquake!" From citizens as real time tremor sensors to active citizen seismologists

***Rémy Bossu, Laure Fallou, Robert Steed, Sylvain Julien-Laferriere, Marina Corradini, Matthieu Landes, Julien Roch and Frédéric Roussel**

"OMG, earthquake!" is typically the first published Tweet following an earthquake felt in the US! Thereby, tremors on Earth's surface can jump to the Internet. The Euro-Mediterranean Seismic Centre (EMSC), a foremost earthquake information center, detects such messages on Twitter as well as surges on its website or app when eyewitnesses rush to find information. These "crowdsourced" detections are reported on its channels well before seismic networks publish their results, allowing it to rapidly engage with eyewitnesses, collect their observations such as felt experience and geo-located pictures and ingest these into rapid situation awareness products for rapid response. The LastQuake system has been pioneering citizen seismology since its inception in 2014. Today, the LastQuake

app has 1.2M users, distributed around the Earth, with hundreds of felt reports routinely collected within minutes of an earthquake. The system is inclusive and accessible (it's free and ad-free, available in 26 languages and makes extensive use of visual communication). It also contributes to seismic risk reduction by including safety checks, safety tips and tsunami alerts. However, public demand keeps evolving; after some earthquakes in Lombok (Indonesia), Albania and Croatia, but also during several project such as in Haiti where they participated in setting up a citizen operated network, the EMSC has observed an increased demand from citizens who don't want to see their role limited to "human sensors". Therefore, LastQuake is being complemented by an innovative citizen science platform called LastQuakers. The platform provides a space for citizens to exchange and learn about earthquakes, regardless of their prior knowledge and cultural beliefs. It gathers users, amateur seismologists and seismologists, giving everyone the opportunity to contribute with questions, testimonies or any kind of scientific data. Based on trust and benevolence, the platform is organized by language, moderated by volunteers and benefits from the LastQuake community expertise. LastQuakers also aims to increase risk awareness and preparedness, fight misinformation (such as fake predictions that flourishes after damaging earthquakes) and involve the wider public in damage assessment. Through offering open, participatory and free education, LastQuakers will empower communities, and improve community resilience.

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Beekeepers, Makers, and Eco Hackers: The Outreach of Citizen Bob and a DIY Sensorkit

***Thorsten Kluss, Carolin Johannsen and Diren Senger**

The project Bee Observer - BOB targets data collection in beehives with an IoT approach (1) to make a dataset publicly available for research purposes and (2) to develop a smart assistance for beekeepers in practice. Citizens have been included at every stage of the research process from generating hypotheses, developing sensors, assessing and evaluating data. In the course of the project a number of additional branches have developed: We exemplify the effect of this apparently straightforward idea on SDGs with selected publications and practical implementations. The conception of a nationwide sensor network makes ecosystems interactions visible and quantifies critical influencing factors, such as pesticides or water shortage. Also, BOB targets sustainable food production including novel minimally invasive beekeeping practices. As a side effect of the fact that apiaries bees are often in places without power sockets, citizen scientists developed alternatives recycling old car batteries, solar panels, or wind turbines. BOB sensor kits are used in didactic concepts for schools and a central instrument in veterinary research at universities. Moreover, BOB actively promotes education beyond academic structures: manuals and program code are available open-source to empower everyone to participate and to further develop the concept. The open knowledge structure facilitates communication between different educational backgrounds as well as lifelong, inclusive learning from woodworking to AI methods. A successful "misuse" of the BOB sensor kit has been accomplished by urban beekeeping cooperatives to enable decentralized management and alternative economic practices. This approach has proven to be successful, especially in weak districts with a high proportion of low-income inhabitants, to reduce poverty, enable social inclusion and offer decent work. Finally BOB has attracted international attention: sensors are used for bee research in Cameroon to promote local beekeeping where the consumption of honey and bee larvae is important for food security. Economic growth, too, motivated siberian beekeepers to use BOB beehives: During the cold Yakut winter, the sensors monitor the survival of the animals in local beekeeping cooperatives. In future, this IoT approach shall be used in citizen science projects to investigate the influence of melting permafrost. Without bees, but with BOB sensors.

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Land Users - Land Watchers

***Jóhann Helgi Stefánsson and Bryndís Marteinsdottir**

GróLind is a collaborative project with the aim of monitoring Icelandic vegetation and soil resources It was founded in 2017 by the Icelandic National Associations of Sheep Farmers, the Farmers Association of Iceland, Ministry of Industries and Innovation, and the Soil Conservation Service of Iceland. GróLind is a collaborative project and cooperation with stakeholders, such as the science community, landowners and others, is a fundamental concept in the project. In this project, the state of vegetation and soils are evaluated, together with changes of those. Currently, a citizen science project is being developed within GróLind, in which land-users will annually monitor, using a mobile app, the conditions of the land they utilize. The monitoring will be based upon permanent photo-points and simple ecological measurements. These data will be used together with more detailed measurements done by specialists, to assess the state and changes in Iceland's vegetation and soil resources. Land users' participation provides more extensive and accurate monitoring, both spatially and temporally. Cooperation between scientists and land users increases the flow of knowledge and trust between groups, ensuring that the knowledge gained in the project will be used for sustainable land management. Furthermore, the data will be used to develop research-based indicators for sustainable land-use that later can simplify the monitoring.

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Harnessing Individual lifestyle choices for engaging citizens in sustainable development - The example of the consumer footprint calculator

Luisa Marelli, Esther Sanye Mengual, *Giulia Barbero Vignola, Sven Schade, Steve Borchardt, Valeria De Laurentiis, Daniela Buscaglia, Michele Maroni, Alexander Kotsev and Serenella Sala

SDGs are at the core of all EU and national policies, and the COVID-19 emergency exemplified further the necessity to re-build the socio-economic-environmental system of Europe according to their embedded principles. There is now more than ever the need for swift actions at all levels of society to make sure that the recovery strategy does indeed bounce the EU forward, towards pathways that facilitate the achievement of SDGs. A shift in development paradigms also requires profound changes in mind-sets and everyday behaviour of citizens. Numerous studies showcased that behavioural changes on an individual level can have positive impacts on tackling climate change and other environmental concerns, compared to the costly implementation of new technologies and innovations alone. Consumer choices largely influence global supply chains, with impact on societies, economies and the environment globally. Raising awareness on the complex implications of their choices, can foster the engagement of citizens towards sustainable development. Lifestyle and consumption choices mostly affect SDG 12, and have several direct and indirect impacts on many other SDGs. Within this context, the JRC has developed a "consumer footprint calculator" tool, based on the life cycle assessment of a number of representative products that an average EU citizen consumes in one year, to estimate environmental impacts of EU consumption in 5 areas: food, mobility, housing, household goods, and appliances. This tool enables the illustrating the impacts of individual choices on more than 15 different environmental aspects. However, consumers' choices and behaviours present a wide array of options and the variability of individual consumer footprint profiles could be very staggering. Hence, there is the need of bridging life cycle assessment and citizen science to collect and capitalize on micro data and information; engaging with citizens in the scientific process of data collection and analysis is pivotal to define improved behaviour-oriented policies. This talk will briefly introduce the JRC consumer footprint calculator, and present the approach for public engagement at the purpose of collecting data on individual consumption and lifestyle choices. It will provide a possibility to discuss tools and methodologies to engage citizen scientists in the context of sustainable consumption.

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THEME 2.
CONCEPTS AND METHODOLOGIES FOR THE SDGS

Evaluation of programmes and projects: instruments, outputs, outcomes

Format: 10-minute presentation + 5-minute Q&A each presentation.

Session chairs:
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Barbara Kieslinger | Centre for Social Innovation – ZSI | kieslinger@zsi.at

There are many stimulating questions in the research on citizen science, especially in the areas of evaluation, quality and communication. Why do citizens participate in citizen science projects? What benefit do they get from it; what benefit does science and reaching the SDGs have? This session will present instruments, evaluation designs as well as results from evaluation and impact research conducted on projects and place them in the context of the promise of citizen science.

PART 1

Design and effects of citizen science projects in freshwater quality monitoring. Results of a global survey

***Sabrina Kirschke, Christy Bennett, Armin Bigham Ghazani, Yeongju Lee, Seyed Taha Loghmani Khouzani and Shuvojit Nath**

Monitoring the progress towards achieving the Sustainable Development Goals (SDGs) is a massive task that calls for vast amounts of data and action related to 232 SDG indicators on a global scale. Research and practice therefore welcome the increasing engagement of citizens in the monitoring process. However, it is still unclear how, and under which conditions, citizen science monitoring activities benefit SDG monitoring. This study sheds light on the design and effects of citizen science projects, taking the monitoring of freshwater and SDG indicator 6.3.2 on good ambient water quality as an example. The main goal is to understand how different design factors of citizen science projects influence the projects' outputs, outcomes, and impacts. To this end, a database of citizen science projects in the field of freshwater monitoring has been built, based on a review of scientific and grey literature, an analysis of different citizen science platforms, and further network search. As a result, we have identified 447 citizen science activities in 97 countries of very high (49), high (27), medium (12), and low (9) human development. Most of the identified activities are located in North America (128), Europe (129), and Asia (87), whereas less were found in Latin America and the Caribbean (54), Africa (31), and Oceania (18). In addition, an online survey has been co-designed with a

range of experts and circulated amongst the identified citizen science activities in freshwater monitoring. The survey was designed around the results of previously published systematic literature reviews, and is comprised of mostly closed questions related to five themes: general project information, design factors related to attributes of citizens, institutions, and interactions between citizens and institutions, and project results. The survey will run until the end of August 2020, and subsequent statistical analyses will inform about the comparative effects of the various design factors on monitoring data, knowledge products, and further impacts. Outcomes of this research will inform the freshwater, citizen science, and broader SDG communities on how to best design citizen science projects for generating knowledge for sustainable development under different framework conditions.

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Effectiveness of participation in environmental citizen science projects: the case of Estonia

***Carmen Kilvits and Monika Suškevičs**

Citizen science (CS) is an increasingly topical field that can potentially contribute to the achievement of UN Sustainable Development Goals (SDGs) in Europe. However, most of CS research to date is still focused on West-Europe. CS in East-European countries, which have recently undergone political and socio-economic transitions, can be expected to face certain challenges, e.g. in terms of citizen participation quality. CS in these countries has received little academic interest, although the number of projects has grown over the last decade. We focus on Estonia and assess project design and public engagement in the example of environmental CS projects. We follow the evaluation framework by Kieslinger et al. (2018) and apply an embedded case study design, by selecting and comparing nine eligible environmental CS projects. We ask three research questions: (1) what are the goals of the selected projects? (2) what type of participation prevails in these projects? (3) which opportunities exist to improve participation quality? Nine semi-structured interviews with project coordinators were held and projects' web pages were qualitatively analysed to answer the research questions. The analysed environmental CS projects in Estonia are mostly targeted at SDG 4 (education) and 15 (biodiversity), to a lesser extent 11 (air quality). Projects are quite similar in their nature: volunteers are mostly involved in the stage of data collection from the physical environment, mainly through public campaigns, which is also common in environmental projects of citizen science outside Estonia. Thus, by participation type, they are mainly contributory and investigation projects, that are using crowd building strategy, where existing communities are less frequently involved. One main way to further develop the engagement in projects would be to acknowledge and reward the participants, which has so far been addressed by only a few of the projects analysed. In the future, it is possible to diversify the field of citizen science in Estonia and improve the effectiveness of engagement. The expectations and visions of the citizens regarding their involvement in citizen science projects requires further study, where more precisely also SDG indicators on participation (e.g. institutions, governance) could be used as evaluation criteria.

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Citizen-seismology in Haiti, understanding citizens' interest and beliefs to enhance community resilience and contribute to risk reduction

***Laure Fallou, Eric Calais, Alice Corbet, Laennec Hurbon, Nixon Calixte, Jean-Marie Théodat, Dominique Boisson, Steeve Symithe, Claude Prépetit, Betonus Pierre, Sophia Ulysse, Tony Monfret, Anne Deschamps, Françoise Courboulex, Jérôme Chèze, Fabrice Peix, Etienne Bertrand, Jean-Paul Ampuero, Julien Baletra, Jean-Luc Berenguer, Rémy Bossu and Valérie Clouard**

On January 12th 2010, a devastating earthquake hit Haiti, costing tens to hundreds of thousand lives. Prior to the earthquake, seismic risk culture in Haiti was low, scientific knowledge and tools were crucially lacking. Since then, the country endeavors to develop a seismic network but faces many challenges as it requests substantial technical and human means. An issue commonly shared by many developing countries. The S2RHAI project seeks to use new low-costs and low-maintenance seismic sensors to (1) complement the national seismic network and, (2) engage with the population to understand their risk perception and the usage they could make of these tools. 10 of these sensors (Raspberry Shakes) have been installed at volunteers' houses or offices, who thus became citizen-seismologists. They have the possibility to monitor small earthquakes, visualize seismic data and contribute to enriching the national network dataset. Additionally, they were invited to integrate a WhatsApp group to exchange with other hosts and qualified Haitians and French seismologists. However, installing technologies alone is not sufficient: they must be effectively used by citizens, and reach a broader part of the population. Citizens' perspective, interests and benefits must then be taken into account. This is where cultural factors come into play. Despite a certain level of knowledge that earthquakes are caused by tectonic plate movements, there are also strong popular beliefs in more spiritual causes, partially linked to voodoo culture. We present here the results of two sociological surveys. One targets citizens in general. Through a quantitative questionnaire, we assessed the understanding and beliefs on earthquake causes, knowledge on behaviors to adopt, information needs and trust towards various actors (scientist, authorities, relatives…). This helped evaluate the potential interest for the project and what should be highlighted when presenting the instrument. The second one consists in interviews with hosts in order to comprehend their use, expectations, and difficulties, as well as to get a first glance at the impact this had on their community. Results contribute to understanding how citizen science can

effectively raise citizens' interest in earthquakes and risk awareness, when cultural factors are acknowledged.

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Evaluating participatory processes critical to citizen science and sustainable development
Eric Jensen and *Alexander Gerber

We present a participatory process evaluation survey instrument designed to be used in a diverse range of citizen science contexts. This instrument was developed by world-leading social science experts in evaluation of public engagement with science and the environment. It was tested during the European Commission-funded TeRRIFICA project (terrifica.eu) in a diverse range of geographical settings and citizen science-led sustainable development initiatives. These initiatives were explicitly linked to the UN SDGs. Here, we show how this instrument gathers robust evidence of the quality of participation, as well as key variables such as motivations and demographics. The instrument follows best practice in survey design, including both positively and negatively framed level of agreement statements (e.g. 'My contribution to the process was valued' and 'The process was badly managed'). This evaluation instrument will be made freely available to use, with translations into different EU languages already developed through the project.

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PART 2

Are we on the same page? Making project engagement and evaluation work across European cities and cultures
***Margarida Sardo, Sophie Laggan, Laura Fogg Rogers, Ilse Vleugels, Anke Bracke and Elke Franchois**

WeCount (Citizens Observing UrbaN Transport) is an H2020 project under the SwafS-programme which aims to empower citizens to take a leading role in the production of data, evidence, and knowledge around mobility in their neighbourhoods, and at street level. The project employs participatory citizen science methods to co-create and use innovative low cost, automated, road traffic counting sensors (i.e. Telraam) and multi-stakeholder engagement mechanisms in several European cities. A number of low-cost, automated, road traffic counting sensors (Telraams) will be mounted on each participating household's window facing a road, which will allow authorities to determine the number and speeds of cars, large vehicles, cyclists and pedestrians. Citizen scientists will be involved in collecting the data, analysing it, and engage with key stakeholders throughout the process. Furthermore, the project will generate scientific knowledge in the field of mobility and environmental pollution, and encourage the development of co-designed, informed solutions to tackle a variety of road transport challenges. Five pilot cities are involved: Madrid in Spain, Ljubljana in Slovenia, Dublin in Ireland, Cardiff in the UK, and Leuven in Belgium. WeCount draws upon the successful ClairCity project. ClairCity was an EU H2020 research project which aimed to raise awareness about air pollution and carbon emissions in our cities, looking at how we all contribute to the problems and how they affect the air we breathe. A total of 8302 people from ClairCity cities/regions directly engaged with the project over its duration. The project evaluation emphasised the importance of designing engagement and evaluation activities that appeal to a wide variety of audiences to ensure that a broad cross-section of society can participate in engagement with policymaking or citizen science. In this paper, we present the WeCount monitoring and evaluation framework, instruments, and tools and will explore how to make them work effectively across different countries, languages, and cultures. We will also give insights on how we adapted to the changes brought by the Covid-19 pandemic. Learnings from ClairCity will be shared, as well as the successes, challenges, and barriers encountered by large-scale evaluations.

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Debunking myths of data quality issues in citizen science
***Nerea Ferrando, Joanna Clark, Macarena Cárdenas, Hilary Geoghegan and Vicky Struthers**

Citizen science has become a common approach for scientific data collection. However, a major barrier to its use are concerns with data quality. Nonetheless, in citizen science projects, data quality is frequently evaluated by comparing volunteer-produced data to measurements taken by scientists as a benchmark. This practice may dismiss the role of citizen science data without investigating the professional's methodology and potential underlying factors that may influence results. The aim of this study is to assess a fundamental practice applied by soil scientists as a proxy for soil health: visual soil colour estimates using the Munsell method. While the validity of these measurements is generally accepted when completed by scientists, similar estimates by citizen scientists are often questioned. We compare the results of soil colour descriptions obtained by trained citizen scientists with the ones obtained by scientists. Our assessment was carried out by evaluating the accuracy and precision of soil colour measured using 3 sets of results obtained from the same samples: the Munsell method taken by i) trained citizen and iii) professional scientists, compared to iii) the spectroscopic method as a true reference. This work is part of the Sustainable Cities Project, where citizen scientists collected soil data during 16 organised events in 2018-2019 in 3 urban parks; Kew Gardens and Cannon Hill Park in the UK, and Les Fontaines in France. The preliminary results show that although professional scientists are more accurate than citizen scientists in estimating soil colour, there is significant variability within all groups due to the subjective nature of this qualitative method. Potential underlying

factors influencing variability may be the heterogeneity of urban soils, the changing environmental field conditions, participant motivations, and program specificities. Thus, it is important to distinguish between interobserver variability and variability due to expertise in citizen science evaluations instead of assuming volunteer-produced data to be substandard. Our hope is to shine a light on the importance of understanding other drivers that influence data quality to refine best practices in citizen science and show that these projects can make scientifically valid contributions that are on par with professional scientists.

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Scalable by design: a Framework to design more impactful CS interventions

***Giovanni Maccani, Margriet Goossensen, Valeria Righi, Mara Balestrini, Chrisa Tsinaraki, Javier Creus and Sven Schade**

Citizen Science (CS) has proven potential to mobilize people in the pursuit of SDGs (Fritz et al., 2019; Fraisl et al., 2020). However, most CS interventions tend to be heavily context-dependent, thus hindering the scalability and spread of the resulting, typically very local, impacts and learning. It becomes therefore hard to extend the impact of CS projects towards addressing the SDGs, which are, by nature, more global. The existing literature provides little evidence on how to foster spread and scalability in CS (Craglia and Granell, 2014; Manzoni et al., 2019), leading to a lack of an acknowledged agreement on what these terms mean, entail and how these can be approached. Why have some projects been more effective at scaling than others? What are the key factors associated with the scalability of CS efforts? This paper addresses these questions by theoretically and empirically investigating the phenomena of scaling in CS. First, inspired by ongoing academic debates on Technology Adoption (Venkatesh et al., 2012), Diffusion of Innovations (Rogers, 2010), and Infrastructuring in Participatory Design, we propose an integrated theoretically grounded framework to be used as the lens to analyse this important, underexplored, phenomena. Second, we relied on the framework to guide an empirical, qualitative analysis. This involved carrying out a multiple case study, of four diverse, successful, cases: Making Sense, FreshWaterWatch, Luftdaten, and OpenStreetMap. In summary, leveraging multiple case analysis allowed us to understand and collectively construct knowledge about scaling from the lived experiences of individuals and projects that successfully undertook these journeys. As a result we propose an emerging typology of four rich scaling scenarios from the different cases studied: (1) Scaling Communities through Narratives; (2) Scaling through Infrastructuring and the Train the Trainer Approach; (3) Scaling through Platform-Enabled Virtuous Cycles; and (4) Scaling through Platform-Enabled Network Effects. Concluding, in addition to unbundling the complex and multifaceted phenomena of scaling in CS, the findings of this study provide theoretically and empirically grounded recommendations for planning new CS interventions that are scalable by design. This presentation will illustrate how these findings can help to design impactful CS initiatives for achieving the SDGs.

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Developing a modular, flexible and scalable impact assessment framework for Citizen Science projects following a co-design approach

***Antonella Passani, *Annelli Janssen, Katharina Hölscher and Julia Wittmayer**

The engagement of citizens in research, data collection, decision-making and integration of local knowledge into science is becoming more and more relevant in the light of current debates on climate change, environmental pollution, and the like. Indeed, participatory practices can strengthen the understanding of public issues and improve trust within a community (Wong et al., 2018) and between communities and scientists. In this context, citizen science (CS) initiatives are flourishing as a way to engage citizens in different phases of the scientific process.
As indicated by a White Paper, edited by the European Commission in 2014, impacts of CS projects can be diverse, covering scientific, inspirational, educational, social, economic, environmental and/or political dimensions. However, they are hard to measure. For each potential impact dimension, the indicators and approach to data gathering are numerous, while often CS projects do not have the time and/or the competences for designing and applying evaluation and impact assessment methods (Kieslinger, et al, 2018). We develop a modular and adaptable impact assessment framework within the ACTION project to evaluate the impact of CS projects (www.action-project.eu, EU-Horizon 2020 grant agreement No 824603). The framework starts with an impact assessment canvas that – following a visual approach – guides CS managers through the whole impact assessment process. Each included impact dimension – scientific, social, economic, political and environmental – is articulated in several dimensions (23 overall). These include, but are not limited to, impact on community empowerment and policy processes, inclusiveness, impact on learning, behavioural change and transformative capacity of the project. The ACTION framework investigates also the contribution of CS projects towards the SDGs and related targets. The framework is accompanied by data gathering tools (questionnaires and focus group guidelines) that make it ready to use by CS project managers. The framework is co-designed with several CS projects: this helps us to assure that it is relevant for the users, clear and actionable. It will be further tested and adjusted in the next 2 years in collaboration with at least 12 CS projects.

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THEME 2.
CONCEPTS AND METHODOLOGIES FOR THE SDGS

Exploring human-nature-relations: Citizen Science in the Anthropocene

Format: 10-minute introduction, 10-minute keynote, 10-minute presentation each presentation + 10-minute discussion.

Session chairs:
Maike Weißpflug | Museum für Naturkunde Berlin | maike.weisspflug@mfn.berlin
Marie Delannoy | French Museum of Natural History | marie.delannoy@mnhn.fr

The Anthropocene – the current age, in which human influence on the earth's surface and biosphere exceeds natural forces – is a widely discussed concept that blurs the boundaries between disciplines, and between non-professional and expert knowledge. This session will discuss whether and how citizen science can be a convincing research approach to the challenges of the Anthropocene. The session combines practical examples of citizen science projects with theoretical reflections on human-nature-relations.

KEYNOTE

"Lost objects, Regained nature": a participatory project to tell the Anthropocene story from a citizen's point of view
***Frédérique Chlous and *Maike Weißpflug**

Short CV

Frédérique Chlous is Professor of Anthropology at the French Museum of Natural History, and Head of the scientific department "Human and Environment".

Abstract

The Natural History Museums of Berlin and Paris are designing a new citizen science project, called "Lost objects, Regained nature" to document our changing representations of biodiversity losses. In an open bottom-up process, people will be encouraged to share documents from the past that are telling them something about biodiversity at that time, something they have forgotten and that strike them for some reason. Such documents may come from personal archives (e.g. old diary, holiday pictures…), reading or other art works, everyday objects, old media, recipe books, hunting kill records, etc. The project may be considered as a large-scale social experiment contributing to rising concern for nature at the individual and collective levels. The resulting open corpus, produced by people, will be an opportunity for many reference narratives on biodiversity changes that should speak to everyone and will tell a human story – or better many human stories – of the Anthropocene. It will also constitute a fantastic source of material for research.

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PRESENTATIONS

Citizen sensing as a way to claim back human agency in the context of the Anthropocene?
***Anna Berti Suman and Sven Schade**

Grassroots-driven environmental monitoring (aka citizen sensing) could revolutionize environmental risk governance and decision-making by instilling more accountability and transparency in the system. Citizen sensing, by its very nature, voices the citizen's claims to have access to (accurate) environmental information and to live in a healthy environment. The practice, as a manifestation of 'rights in action', can thus enhance the respect of human environmental rights and promote their enforcement. Furthermore, this particular form of environmental monitoring could potentially reverse the so-called 'extinction of experience', that is, the progressive detachment of the citizen from nature. Citizen sensing could also engage the layman in the institutional implementation of the Sustainable Development Goals, specifically for what regards the promotion of human health and a healthy environment. In the context of the Anthropocene, however, some scholars and scientists have argued that humans (should) lack agency in relation to the environment, as they are the primary responsible of environmental degradation and catastrophes. Yet, citizen sensing calls in people's responsibility to 'take care' of their surrounding environment. The data generated from sensing could turn out to be a convincing ground to support claims, eventually also in environmental and climate litigation, vis-à-vis authorities. Could these practices be a convincing research approach and mode of action to bring (lay) people in control of the challenges of the Anthropocene and part of the response thereof? This contribution explores citizen sensing in the framework of socio-legal theoretical reflections on the Anthropocene, in order to demonstrate how the 'monitoring citizens' can claim agency and play a pivotal role in steering environmental policies, decision-making and - eventually - justice.

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Citizen Science as a tool to Assess Human-Wildlife conflict and coexistence for wildlife species in human-dominated landscapes
***Emu-Felicitas Ostermann-Miyashita and Hannes J. König**

In the current century of severe biodiversity loss, the coexistence of humans and other species is more important than ever. In some parts of the world, this coexistence is becoming increasingly challenging, as

some species have returned, and have in a few cases even expanded their former habitats, due to conservation measures, climate change and other causes. While this is welcomed by a part of the public with high nature conservation interests, the directly affected local residents are concerned for their livelihoods, causing social conflicts among citizens with different views and interests. To prevent further loss of valuable species, and at the same time allay fears of directly affected stakeholders, it is essential to gain accurate data of the respective species and to communicate correct knowledge to the general public. We introduce our study, which has reviewed citizen science (CS) projects in the field of human-wildlife conflict (HWC) to examine how CS can contribute to a better human-wildlife coexistence. The results show that CS (i) is an effective tool for gathering wildlife data, and at the same time (ii) empowers citizens to participate in or drive (in a bottom-up manner) wildlife research and management. It was also found that each HWC has a unique social, economic and geographical context, which makes it challenging to find appropriate mitigation measures. To address this, we developed a Global and Local Geographic (GLG) model that provides practical guidelines for implementing CS in HWC research. This model has combined two common polarizations which are found in the field of conservation: the global polarization between developed countries (north) and developing countries (south) and the rural-urban polarization between the directly affected local population and the urban population living at a "safe distance" from the species in question. Finally, we found that the inclusion of youth is fundamental to achieving coexistence between people and wildlife. Therefore, we encourage integrating CS into formal education or including an educational component in CS projects. This can lead to a sustainable coexistence of humans and wildlife by fostering a future generation with high environmental awareness and is supportive of wildlife conservation.

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The role of the citizen humanities in the biocultural diversity discourse
Barbara Heinisch

The Sustainable Development Goals aim at a more sustainable and better future. However, they are also being criticized for excluding certain perspectives and topics, such as biocultural diversity, which encompasses biodiversity, cultural diversity and linguistic diversity and their interrelations. Biological, linguistic and cultural diversity do not only constitute biocultural diversity but are, to a large extent, also key aspects studied by the humanities. The humanities also especially address human-nature relations as well as linguistic and cultural diversity. So do the citizen humanities, which are defined as citizen 'science' done in the humanities and which engage participants in academic humanities research. Although humans and nature are being studied by different branches of knowledge, namely the sciences and the humanities, they strongly influence each other. Therefore, to study, understand and preserve biocultural diversity the (citizen) sciences and the (citizen) humanities should work together. The responsibility of the (citizen) humanities in the discourse on the Sustainable Development Goals is, among others, to address topics related to the Anthropocene. These include the role of humans who change the planet, languages as a means to experience the world (differently) as well as the relation between human history and natural history. Language and culture offer numerous ways of referring to and interpreting reality. These different ways of seeing the world also offer different approaches to preserving biocultural diversity. Exemplified by three citizen humanities projects in the field of biocultural diversity, this article emphasizes the role of the citizen humanities in the discourse on the Sustainable Development Goals and the Anthropocene. This role includes to reveal dissonances, to address behavioral change or expose different perspectives to scrutiny.

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THEME 2.
CONCEPTS AND METHODOLOGIES FOR THE SDGS

Contribution of Citizen Science Data to Monitoring the SDGs

Format: Symposium + Q&A from participants.

Session chair:
Dilek Fraisl | International Institute for Applied Systems Analysis (IIASA), Research Scholar at the Center for Earth Observation & Citizen Science | fraisl@iiasa.ac.at
(session organised by WeObserve)

The UN Sustainable Development Goals (SDGs) were adopted by the UN General Assembly in 2015 as a call to action to tackle the world's greatest challenges such as poverty and climate change. With its 17 goals, 169 targets and 247 indicators, the SDGs reflect a data-driven and society-oriented framework that requires a collaborative effort from all levels of society to achieve the future we want and to leave no one behind. Crucial to their success is timely, reliable and comprehensive data that are difficult to gather using traditional sources of data alone, such as censuses and household surveys. Coupled with these traditional methods and other new sources of data such as Earth Observation (EO), and mobile phone data, citizen science has an immense potential to address these data gaps. A recent study by Fraisl et al. shows that citizen science data have the potential to contribute data to 33% of the SDG indicators. This session aims to demonstrate the value of citizen science data for tracking progress of the SDGs, drawing upon concrete examples that outline the use of citizen science data by NSOs and UN agencies. We will discuss the challenges and barriers for the uptake of citizen science data for feeding into SDG monitoring processes, and how we can bring it into the scope of official statistics through recognition by governments, national statistical offices (NSOs), the UN system, and other data producers and users, from the perspective of the representatives of all these stakeholders.

Citizen science to complement official statistics and mobilize action
Steffen Fritz

The UN Sustainable Development Goals (SDGs), a roadmap to creating a more sustainable future for all, can only be achieved through an accelerated transformation, which includes drastic changes in policy as well as behavioral changes by citizens. In order to understand to what degree policies are implemented and effective and to what degree behavior is changing, an up-to-date and cost-effective monitoring system is required, which is based on accurate, timely and comprehensive data. The traditional sources of data that are currently used for SDG monitoring are not sufficient for addressing current monitoring needs. Citizen science, as a new source of data, could be leveraged to complement and improve official statistics. This talk outlines the value of citizen science for SDG monitoring by showcasing citizen science tools and projects. This will include, among others, a generic and flexible tool developed by IIASA, i.e., the Picture Pile app, which can help to monitor several of the SDG indicators, from poverty mapping to deforestation.

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Citizen science for the SDGs and official monitoring
Jillian Campbell

Currently there is not sufficient data for global monitoring of 68% of the environment-related SDGs. These data gaps are even more pronounced for local level monitoring in some parts of the world. Filling data gaps using traditional data collection is not feasible financially or from a human resource perspective. This talk will outline the need to use non-traditional data sources, such as citizen science, for filling data gaps and improving the global understanding of the SDGs and related environmental indicators.

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Litter Intelligence: Citizen Scientists delivering on SDG 14.1.1.
Camden Howitt

Sustainable Coastlines – a New Zealand-based NGO – presents its Litter Intelligence program; a nationwide effort to monitor beach litter, create powerful insights, and inspire action to prevent litter long-term. Launched in 2018, the program was co-designed with New Zealand's Ministry for the Environment, Department of Conservation and Stats NZ, and adopts a localised adaptation of the UNEP/IOC Guidelines on Survey and Monitoring of Beach-Cast Litter. To date, Sustainable Coastlines has provided training to engage over 5,000 Citizen Scientists in submitting data to litterintelligence.org – our open-access national beach litter database – via 472 surveys of 161 beaches around the country. The programme has also achieved major citizen science milestones, after being included the official government 'Our Marine Environment' report in October 2019; the first time that Citizen Science data had been accepted at this highest reporting level. The programme was also included in New Zealand's first Voluntary National Review on the SDGs in July 2019, and more recently featured in the paper 'Mapping citizen science contributions to the UN sustainable development goals', in the journal 'Sustainability Science'.

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Organizing to Support Citizen Science for the SDGs
Anne Bowser

Citizen science projects may be designed to meet unique local, regional, or national research and monitoring needs. In some cases, this leads to a tension between respecting local authority and agency on one hand, and promoting interoperability and data re-use on the other. Since 2015, the Wilson Center has engaged in two programs – Global Mosquito Alert, and Earth Challenge 2020 – that seek to understand how to broker effective citizen science collaborations and promote data reuse. This talk will evaluate the successes and challenges of both initiatives to explore opportunities for better involving exiting citizen science data in SDG reporting.

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Citizen Science to strengthen the National Statistical System
Omar Seidu

The Ghana Statistical Service (GSS) in 2016 began a process to determine the data availability in the National Statistical System (NSS) to report on and help achieve the Sustainable Development Goals (SDGs). Ghana's SDGs Baseline Report in 2018 had only 70 indicators, but a data roadmap organised in April 2017 had identified three priority areas for action to increase data availability thus: filling data gaps, encouraging data use and strengthening the entire data ecosystem. As a consequence, a new law that gives greater mandate to GSS for exploring the use of non-traditional data for official statistics was passed in 2019. Several projects including using citizen science methods and citizen generated data have been initiated to fill critical data gaps. This talk will highlight GSS efforts and progress at leveraging these new data for SDGs monitoring in Ghana.

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THEME 2.
CONCEPTS AND METHODOLOGIES FOR THE SDGS

Citizen observatories: the landscape, tools and data innovations for sustainable development

Format: Speed talks.

Session chair:
Valantis Tsiakos | Institute of Communication & Computer Systems (ICCS) | valantis.tsiakos@iccs.gr
(session organised by WeObserve)

This session invites contributions from Citizen Observatories (COs) and projects that identify as such, to join for an interactive 'meet-and-greet' session and to showcase CO tools and innovations that support sustainable development. This session will provide an overview of the current landscape of COs and present innovations from them, such as new methodologies and conceptual models, as well as data innovations from hackathons, innovation and open data challenges. Alongside selected contributions, the WeObserve project will present a co-design toolkit to generate ideas for new COs for public participation, environmental monitoring and disaster management in the context of the SDG framework, as well as results from the WeObserve Open Data Challenge.

LandSense: Coupling citizen science and earth observation data to promote environmental monitoring
***Inian Moorthy, Linda See, Gebhard Banko, Sofia Capellan, Vladimir Mrkajic, Ana-Maria Olteanu-Raimond, Elizabeth A. Schrammeijer, Michael Schultz, Matej Batič and Steffen Fritz**

The Horizon 2020 project, LandSense, is a modern citizen observatory for Land Use & Land Cover (LULC) monitoring, that connects citizens with Earth Observation (EO) data to transform current approaches to environmental decision making. Citizen Observatories are community-driven mechanisms to complement existing environmental monitoring systems and can be fostered through EO-based mobile and web applications, allowing citizens to not only play a key role in LULC monitoring, but also to be directly involved in the co-creation of such solutions. Within LandSense, citizens can participate in ongoing demonstration pilots using their own devices (e.g. mobile phones and tablets), through interactive reporting, gaming applications and mapathons. Campaigns in Vienna, Toulouse, Amsterdam, Serbia, Spain and Indonesia address topics such as urban greenspaces, agricultural management and biodiversity/habitat threat monitoring. For example, in the case of Toulouse and Indonesia, hotspots of change in LULC are identified through Sentinel 2 time series

analysis. These hotspots are then validated by citizens and interested stakeholders either directly on-site via customized mobile applications, providing geotagged photos, or remotely via the online LandSense Engagement platform. The presentation will not only showcase the tools and results from these campaigns, but also highlight how citizen-driven observations can contribute to sustainable development. Such initiatives present clear opportunities to integrate citizen-driven observations with established authoritative data sources to further extend GEOSS and Copernicus capacities, and support comprehensive environmental monitoring systems. In addition, these applications have considerable potential in lowering expenditure costs on in-situ data collection and current calibration/validation approaches within the processing chain of environmental monitoring activities both within and beyond Europe.

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Citizens in the epicenter: Smart technologies in the service of citizen-driven flood monitoring and management

***Valantis Tsiakos, Athanasia Tsertou, Georgios Tsimiklis and Angelos Amditis**

The H2020 SCENT project (https://scen-project.eu/) has created a toolbox of smart technologies and applications that aims to enable citizens to monitor Land Cover/Use (LC/LU) changes and how these affect flood phenomena in their urban or rural areas. Citizens simply use low-cost equipment to collect various environmental information, that are consolidated to improve flood modelling and will be offered to several national repositories and GEOSS as OGC-compliant observations. SCENT organised large-scale demonstrations in Danube Delta Romania and in Kifisos river basin in Greece. These field campaigns took place in several different dedicated periods in both areas, while focusing on themes of interest to the local communities and the policy makers such as the collection of LC/LU elements, river parameters and soil measurements. One of the aspects showcased through the SCENT toolbox in the field demonstrations is its overall ability to improve flood models to be used for policy making with the citizen-science data collected. The flood models were designed to help decision-makers in terms of flood risk management (prevention and protection) and for the management of natural areas. Results generated by the flood models can be used to design river interference measures that respect sustainable river basin development (SDG 11), to simulate climate change impacts on local flooding (SDG 13) and to help manage the health of aquatic ecosystems (SDG 14). Furthermore, SCENT demonstrated the potential and exploitation of citizen sensed environmental information in combination with conventional earth observation data sources. More specifically, citizen-generated LC/LU information along with satellite images were used to train and properly configure the state-of-the-art deep neural network models allowing the production of improved semantically meaningful raster LC maps. Monitoring land cover and land use change is important for land resource mapping, understanding ecosystem services including resilience to climate change, natural disasters and biodiversity conservation. Thus, the SCENT approach facilitated the extension of current repositories by allowing for more frequent updates of local monitoring of LC/LU changes and with higher spatial resolution, using inexpensive crowd-sourcing tools while contributing to SDGs indicators such as 6.6.1, 9.1.1, 11.3.1, 11.7.1 and 15.3.1.

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Experiments with interoperability to unlock the meaning within Citizen Science data

***Joan Masó, Ester Prat and Andy Cobley**

Citizens' observatories (COs) connect people, science and technologies to create collaborative data, knowledge and action around environmental challenges, both local and global. However, imagine a world where 503 environmental science projects collect data in 503 independent silos with no easy method of connecting the data together. This is what a recent study from the JRC has found. The GROW project took data from a soil sensor that is stored in the cloud and indexed on the platform which also provides an access point data formats for citizens. Data was then transferred to a second platform which packages the data for retrieval by scientists via an API, for analysis and integration with datasets from Copernicus. However, where no standard way to process requests for data from scientists is present, requests were often processed by hand. Even if it was, combining data from more than one project will be a challenge due to different formats and concepts behind the data. In 2016 the COBWeb project delivered the SWE4CS discussion paper on how to use SWE standards to share Citizen Science data. Not many projects have taken the recommendation and seriously implemented it, partially due to lack of practical examples. In 2019 the WeObserve Interoperability Community of Practice wanted to test the approach and organized a Citizen Science Interoperability Experiment (IE). The IE demonstrated some approaches on using clients and services implementing OGC Sensor Observing Service. The IE was participated by the GroundTruth 2.0, GROW, Scent and HackAir Citizen Observatories among others. The final aim was to propose solutions on how Citizen Science data could be integrated in the Global Earth Observation System of Systems (GEOSS). The solution is necessarily a combination of technical and networking components, being the first ones the focus of this work. The application of international geospatial standards in current Citizen Science projects to improve interoperability is one of the main tasks in the second phase of the IE. We are extending the demonstrations to cover potential solutions for connecting CO data with each other and other data sources lighter protocols such as the OGC SensorThings API.

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WeObserve Open Data Challenge: Reflections and implications of open data on the sustainability of Citizen Observatories (COs)

***Mel Woods, Raquel Ajates and Saskia Coulson**

The value of data in citizen observatories is widely recognised, as well as a clear end-use for monitoring, access to it can support the motivation and participation of citizens and scientists alike. However, whilst open datasets are an increasingly common output of citizen observatories (COs), uptake of the data to generate innovative and sustainable open data solutions is rare. To address this, the Open Data Challenge (ODC), a competitive online event designed to support data innovation for critical environmental issues was framed and delivered. The ODC had a number of aims: to amplify the innovation potential of data; to support the development of prototypes through an award of a tender; to engage a global community with open environmental datasets; and to raise awareness of the environmental issues at stake. Furthermore, the ODC delivery team identified opportunities for network building with participants to existing projects. To support the challenge, four COs made their datasets publicly available for the first time. These datasets were framed by seven social and environmental themes as innovation challenges that were positioned as hooks to the call. These included: ecosystem monitoring; public infrastructure management; community-based disaster management; regenerative food growing; pollution monitoring and health; engaging young people; and innovative applications e.g. COVID19. This paper reports on the process of co-designing the framing challenges and delivery of the ODC activity with respect to its aims. Furthermore, authors provide insights on the effectiveness of engagement and facilitation, reflecting on our steps to enable participation for those unfamiliar with the format and the data in order to promote a diverse and inclusive space appropriate to a global online format. Finally, the outcomes of the tender and insights on the implications of open data and data challenges on the sustainability of COs are presented.

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Open source toolkits for Citizen Observatories

***Saskia Coulson, Mel Woods and Raquel Ajates**

This paper examines open-source tools and toolkits that support high-levels of public participation in the scientific process. The authors present a contextual review of existing resources which identifies a gap in the provision of open-source, accessible and collaborative tools for citizen science and citizen observatories. Whilst it is recognised that much has been done in this space, as evidenced by the rise of toolkits as a concept, open and accessible methods and tools remain elusive. The authors argue this lack of tangible and adaptable resources hampers the uptake of citizen science practices for tackling global challenges. The paper presents a categorisation of four crucial areas where there are minimal tools that support engagement efforts, namely: i) Co-Designing a Citizen Observatory - tools for the holistic co-creation and co-design of a Citizen Science project or Citizen Observatory ii) Data Capture for Environmental Monitoring - tools that enable communities to elect which environmental concerns to measure and co-design sensing strategies iii) Data Quality and Visualisation - tools that support citizens in the analysis and presentation of findings iv) Evaluation and Advocacy - tools which help to capture the impact and change of citizen science projects. This paper reports on the findings from a study into toolkits with the citizen science community, and insights from the process of collating of tools from the field are presented. In addition, the discussion signposts to the growing number of platforms which aim at providing repositories and considers the potential of these burgeoning initiatives, e.g. levels of facilitation required, specific competencies for use, and barriers to resource sharing and toolkit interoperability. Authors also present some of the existing tools and toolkits which seek to address the above areas gathered from a range of projects using participatory approaches. The paper concludes with recommendations for future practice, best practice for design of resources, and the value of open-source tools and toolkits in the field of citizen science.

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Engaging citizens in improving air quality and designing healthy and people-centred cities. The NordicPATH project in Scandinavia

***Nuria Castell, Sonja Grossberndt, Enza Lissandrello, Rasmus Steffansen, Nicola Morelli, Jenny Lindén, Marta Segura Roux, Karin Ekman, Marisa Ponti and Anna Broberg**

NordicPATH is a research and innovation project whose overall objective is to establish a new model for citizens' participation and collaborative planning in the Nordic countries focused on urban air quality and the interlinked challenge of climate change. This project focuses on strategies to engage citizens in the process of socio-technological change required by planners and designers to provide the built environment and the services that will shape future sustainable cities with a human-centred approach. NordicPATH will investigate how technologies can facilitate processes of collaborative co-design of solutions towards shaping more liveable, healthy and sustainable cities for everyone. The main research question is therefore whether bottom-up processes can be concretely combined with urban planning practices and policy processes in relation to important environmental issues. NordicPATH will use methods for active co-design, building on environmental co-monitoring and participatory urban co-planning in Nordic cities and utilizing crowdsourcing through strategies of citizen involvement. Environmental co-monitoring will make use of new low-cost sensor technologies capable of offering real-time data on air pollution. Participatory urban

co-planning will use new map-based survey technologies (PPGIS) to get ideas and insights from residents. A key aspect of the project is to transform data into tangible information that can be incorporated into the work of urban and environmental planners.
The project aims to contribute to the integration of different dimensions of urban sustainability and resilience in the framework of the UN Sustainable Development Goals. In particular, it contributes to Goal 11 in making cities inclusive, safe, resilient and sustainable; to Goal 3 creating healthy environments and promoting well-being for all at all ages and to Goal 4 equipping locals with the tools required to develop innovative solutions to the world's greatest problems. NordicPATH will work in four Urban Living Labs in Norway, Sweden, Denmark and Finland. These urban laboratories will provide the necessary learning arenas to explore best practices in citizen involvement.
NordicPATH is partly supported by NordForsk through the funding to Nordic participatory, healthy and people-centred cities, project number 95326.

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The International Odour Observatory – A co-designed resource by and for the quadruple helix of stakeholders
***Louise Francis, Hannah Stockwell and Maria Alonso**

Odour represents a significant proportion of citizens' environmental complaints across Europe. Frequent exposure to odours can affect people's health, wellbeing and quality of life (SDG3). Odour can also indicate environmental issues, e.g. poor waste management, wastewater leakages and air pollution. However, odour pollution is largely ignored in policy agendas, leaving citizens without recourse and regulators with little power. Much of the discourse and data such as the number of complaints, if recorded at all, often remains hidden. This can lead to socio-environmental conflicts within impacted communities, breeding a culture of powerlessness and mistrust. This is unsustainable - particularly where citizens could be part of the solution, such as better recycling of waste to reduce the effort required for waste collection (SDG12 &14) or the adoption of active travel to reduce air pollution (SDG11) and thereby reduce odour. D-NOSES (Distributed Network for Odour Sensing, Empowerment and Sustainability) is an EU H2020 project that aims to build a multi-level governance model for increasing sustainability in communities suffering from odour pollution. Combining citizen science and participatory strategies, D-NOSES seeks to help citizens co-create solutions with industries, regulators and odour experts using a quadruple helix stakeholder approach. To support this and increase transparency, the International Odour Observatory was co-designed to fill the gap in accessible information. It combines participatory tools and an informative website to appeal to all stakeholders: citizens, industry, researchers and policymakers. The participatory tools include OdourCollect, an App to collect citizens' real-time odour observations and Community Maps, an interactive interface to visualise, collate and collect odour information. This is supported by GeoKey, a web-based infrastructure to store user-generated geographic information. Community Maps combined with GeoKey offers a flexible, scalable system for any citizen science project tackling sustainable development. Their use, to date, includes addressing challenges related to air quality, food insecurity, climate resilience and agricultural practices, biodiversity monitoring and illegal logging.

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Using analytics for community monitoring and support in online citizen science projects
***Sven Manske, Julia Lorke, Peter Lemm and Ulrich Hoppe**

While the body of knowledge about WHAT is learned through participation in online Citizen Science projects has grown over the past years (Aristeidou & Herodotou, 2020), the research field also shifts focus to better understand HOW task-sharing and learning happen in Citizen Science (CS). Technology-enhanced and online citizen science projects allow for analytical tools to be applied directly to digital traces (e.g. Herodotou et al. 2020, August et al., 2020). Even in the absence of explicit (inter-)action logs from project activities, we can rely on accumulated "knowledge artefacts" as data sources, for instance in the form of forum postings or blog entries. Question-answer or request-reply structures in such user-generated knowledge bases can be extracted and transformed into social network graphs that represent the structure of the underlying interactions. Centrality measures such as Eigenvector centrality or "Page Rank" allow for identifying influential users in such contexts (cf. Franceschet, 2011; Tang & Yang, 2010). The distribution of these measures of influence between citizen scientists (volunteers), assigned community moderators and professional scientists reflects the roles of these different groups in a project community. Increasing individual centrality values over time indicate a growing influence of a participant and enable us to map individual learning trajectories. In the context of the EU project CS Track, we have applied this methodology to the popular Zooniverse project Chimp&See, which is based on the analysis of wildlife camera recordings especially of chimpanzees across Africa. The project has an explicit conservation goal (SDG 15 - Life on land) and has involved more than 5500 volunteers. We analysed the communication between volunteers, scientists and moderators in the public discussion forum using techniques of social network analysis. The findings show that moderators play a crucial role in mediating and coordinating citizen science activities. Using this example, we demonstrate

the potential of network analysis methods to help in the design, facilitation and assessment of participation, decision-making and knowledge-building in such online communities. This has the potential to support CS projects in contributing to quality education (SDG 4) and possibly even gender equality (SDG 5) in science education and participation in science.

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THEME 2.
CONCEPTS AND METHODOLOGIES FOR THE SDGS

WeObserve showcase: demonstrating value and applications of Citizen Observatory data

Format: Short presentations, online marketplace

Session chair:
Valantis Tsiakos, Institute of Communication & Computer Systems (ICCS), valantis.tsiakos@iccs.gr
(session organised by WeObserve)

This online session aims to provide an overview of a series of innovation activities of downstream applications and value creation of Citizen Observatories (COs) outputs and data for business, policy and EO stakeholders (including SMEs and industry, but also other downstream audiences, such as government agencies, emergency managers and policy makers). The main focus lies on the results from the WeObserve Open Data Challenge and hackathon that harness the value of citizen science data for tackling real world environmental challenges as well as promote aspects of interoperability between COs. Additionally, success stories where citizen science data are combined with conventional sources of Earth Observation data are presented.

WeObserve Open Data Challenge – CitSci Manager
***Turam Purty, Kiranmayi KL Chandra, Vignesh Misal, Ashish Anand**

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CitSci Manager is an open-source tool that helps citizen science researchers, enthusiast and volunteers save valuable time in exploring open datasets spread across a variety of data formats. The tool allows users to freely access metadata headers and sample datasets from a diverse set of projects and generate custom files for research and analysis. Opening up sample of data in such a manner gives citizen science researchers, volunteers and other open data enthusiasts in the community to accelerate collaborations in environment and climate change research.

WeObserve Open Data Challenge – Hi-Terra
***Gulsen Otcu, Bulent Bedir, Mehmet Umut Sen, Ersin Kanar, Vignesh Misal, Ashish Anand**

Hi-Terra is designed as a platform which will perform data processing to generate forecasts of soil moisture and watering. Since it has a dynamically learning capacity, the model is able to improve the forecast performance and to iteratively advance itself by using more data sets. It constitutes a sensitive, intelligent and reliable platform

to produce forecasts for users both to get insights about soil moisture, watering time, amount of watering and to be notified about severe weather conditions, irrigation needs or water level anomalies. Hi-Terra provides resource efficient, cost effective and easy-to-use solution while taking its unique characteristic from the deep learning algorithms in its core. Hi-Terra, as an infrastructure, has a capability to be used within a wide spectrum of application areas from personal landscapes (gardens, yards), greenhouses, fields to golf courses, greens.

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INSPIRE Hackathon – Results from the citizen science challenges

**Valantis Tsiakos, Michal Kepka, Georgiana Bere, Léa Manoussakis, Datopian João Andrade, Koushik Panda*

WeObserve has introduced and organised three citizen-science challenges in the context of the Dubrovnik INSPIRE Hackathon. The goal of these challenges is to improve interoperability between Citizen Observatories and existing citizen science community activities while also making a whole range of citizen science sources data and information both discoverable and accessible together with other sources such as Copernicus and GEOSS. In particular, the following aspects were investigated and addressed from the participants in the challenges:
i. Realisation of techniques to enhance geospatial and/or INSPIRE enabled web-based or mobile application so as to connect to either Citizen Science and/or Earth Observation data. Particular focus was given on improving accessibility to protected citizen science resources while also enabling their direct consumption and utilisation by third party applications.
ii. Implementation of data harvesters so as to enable integration of datasets provided from Citizen Observatories, with a central catalogue, as an approach to connect citizen science into GEOSS.
iii. Making available datasets provided by H2020 Citizen Observatories as well as by other citizen-science projects and initiatives, through the use of OGC SensorThings API standard and mapping of data coming from different sources. This involves also sharing of environmental measurements coming from different IoT devices and in-situ monitoring sensor networks, aiming to establish combined use of data and services among different platforms towards improved environmental monitoring.

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Citizen Observatories for Earth Observation (CO4EO): From examples to best practices

***Valantis Tsiakos, Joan Masó, Linda See, Uta Wehn, Catherine Cotton, Elizabeth Gil-Roldán, Andy Cobley, Mel Woods, Drew Hemment, Rianne Giesen, Yannis Kopsinis, Athanasia Tsertou, Angelos Amditis, Inian Moorthy, Tobias Sturn, Matej Batic, Grega Milcinski, Steffen Fritz, Mathias Karner, Juan Carlos Laso Bayas, Dilek Fraisl, Luca Zappa, Angelika Xaver, Wouter Dorigo**

Traditional environmental monitoring systems such as Copernicus, produces a variety of valuable datasets relevant to environmental monitoring (i.e. land-cover/use, atmospheric emissions, ocean water quality, etc). This data is meticulous and offered for the entire EU landscape, however its update rate is scarce due to increased costs and timely data validation procedures. Citizens' observations, data and information can complement these official, traditional in-situ and remote sensing data sources, allowing relevant authorities to improve and fill gaps in the environmental monitoring process. Two interactive events (workshop and webinar) were organised by the H2020 WeObserve project, aiming to present success stories where citizen science data are combined with conventional sources of Earth Observation data. Focus was given to showcase best practices arising from the activities of H2020 Citizen Observatories (LandSense, GROW, GroundTruth 2.0, SCENT) and from other projects as well, while illustrating how the integration of Earth Observation and citizen science can improve environmental monitoring.

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THEME 2.
CONCEPTS AND METHODOLOGIES FOR THE SDGS

Transformative potential of citizen science and citizen observatories for mobilising action towards achieving the SDGs

Format: 5 speed talks and a 45-minute panel discussion.

Session chair:
Uta Wehn | IHE Delft Institute for Water Education | u.wehn@un-ihe.org
(session organised by WeObserve)

This session concludes the WeObserve thread of the conference. Achieving the SDGs requires behaviour change of individuals as well as organisations on unprecedented scales. This session will address the transformative potential of CS and COs towards the SDG agenda. It will position CS and CO as integral policy measures and support measures for disaster management and emergency response and not 'just' as instruments for monitoring policy attainment.

SPEAKERS

- Valantis Tsiakos, Institute of Communication & Computer Systems (ICCS), valantis.tsiakos@iccs.gr
- Mel Woods, University of Dundee, m.j.woods@dundee.ac.uk
- Michele Ferri, Alto Adriatico Water Authority, michele.ferri@distrettoalpiorientali.it
- Steffen Fritz or Inian Moorthy, IIASA, fritz@iiasa.ac.at
- Stijn Vranckx, VITO, stijn.vranckx@vito.be

THEME 2.
CONCEPTS AND METHODOLOGIES FOR THE SDGS

Participatory Citizen Social Sciences towards the SDGs

Format: Round table with a moderated debate after a short statement (5 min) about conducting citizen social science research on SDGs.

Session chairs:
Stefan Thomas | University of Applied Sciences Potsdam | stefan.thomas@fh-potsdam.de
David Scheller | University of Applied Sciences Potsdam | david.scheller@fh-potsdam.de
(session organised by Co-Act)

In this session, we want to discuss the following questions: What are the specificities and necessities when it comes to citizen social science in the field of SDGs? Do we need a truly participatory and collaborative methodology framework beyond the current debate in CS? Is there a difference between citizen social science and citizen science more generally? Is such a subset within the frame of a general citizen science necessary? What has to be considered if we conduct CSS towards the SDGs?

Stakeholder engagement methodologies and practices for citizen (social) science
Francesco Mureddu

The achievement of the Sustainable Development Goals requires engagement of the public aimed at putting pressure on businesses and governments to take action and to change the current state of things, but also on the fostering and generating the societal transformations that are required to achieve the SDGs. Further, tracking progress towards the achievement of SDGs requires the availability of high quality, timely and accessible data, in particular in areas where data at the moment are limited. Both these requirements are fulfilled in citizen science projects, which apply participatory and collaborative methodologies for implementing scientific research. In this regard, it is very interesting to figure out if citizen science applied to social sciences is more appropriate to reach Sustainable Development Goals with respect to citizen science applied to natural science. The session presentation will be structured in three main parts:

- In the first part we will discuss the extent to which there is an epistemological difference in the use of citizen social science and citizen science more generally (1 minute)
- In the second part we will discuss to what extent the use of citizen social science is more appropriate to achieve the Sustainable Development Goals, and we are going to produce specific examples of projects and experiments (2 minutes)

- In the last part we will discuss to what extent the methodologies of engagement carried out in the REINFORCE project (Research Infrastructures FOR Citizens in Europe) can be applied to citizen social science in achieving the sustainable development goals. Further, we are going to discuss what are the lessons learned from the engagement of marginal groups in REINFORCE, such as disadvantaged groups in terms of visual impairments, age, gender, rural residencies, or social criteria, and that can be transferred to citizen social science. Taking into account the specificities in the application of citizen social science, especially in the view of achieving the sustainable development goals (2 minutes).
- In the framework of the citizen engagement approach aforementioned, researchers will moderate an informal discussion in which attendees will have the opportunity to ask questions and discuss how citizen science projects can help in achieving the Sustainable Development Goals.

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Towards a transformative Citizen Social Sciences for the accomplishment of the SDGs

***Emilia Aiello, Teresa Sorde-Marti and Ana Burgués de Freitas**

Paradoxically, social sciences have many times turned its back towards the most pressing societal problems, getting trapped within the boundaries of academic debates erected in Ivory towers. On the contrary of this, creating scientific knowledge capable to inform the progress of the SDGs requires a radical shift towards a "Transformative citizen social science" elaborated on the grounds of theoretical and methodological standpoints that allows to truly capture and analyze underlying societal dynamics at the light of their impacts on enduring systemic inequities. Drawing on this context, in this communication we present and open the discussion about three elements that are of utmost relevance to advance towards this transformative CSS perspective. First, embracing research oriented to address the SDGs from an interdisciplinary approach. In this regard, the role of social sciences should be that of incorporating a critical view that ensures that any problem or potential solution will be discussed at the light of intersectional inequalities, and the needs on the ground of those most at-risk communities (from ethic and cultural minorities, migrants, refugees, displaced people, people with disabilities, or others). Second, the non-existence of hierarchies among the different disciplinary teams, that being ensured by dialogic leadership of scientific consortiums. Third, the inclusion of grassroots publics, and especially those most hard-to-reach groups, throughout the research process, since its design, implementation, and evaluation. These elements will be discussed by reflecting on existing examples of on-going and past European research projects in which the authors have participated.

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Addressing the Sustainable Development Goals through the design of digital games by middle school, high school and apprentices

***Margarida Romero and Maher Slouma**

In the last years, youngsters worldwide have developed an increased awareness on sustainable development. A first stage in this awareness concerns their concerts about nature, realizing later the complex nature of sustainability in the context of globalised economies (O'brien, Selboe & Hayward, 2018). Given the current climate challenges, young people can develop a transformative agency (Westley et al. 2013). The development of a transformative agency can be supported by active pedagogies, such game based learning for sustainable development (Genevois and Leininger-Frézal, 2010). In this context, the App VER project aims to engage middle school, high school and apprentices in the design and creation of digital games to develop objectives related to the Sustainable Development Goals (SDG). Through the process of designing games, youngsters develop a better understanding of the SDGs identified by the United Nations and the eight priority axes of sustainable development that have been identified by the Ministry of National Education and Youth in France. During the game creation workshops, the transformative agency developed among the young participants through the design and co-creation of digital games is supported by their engagement in freely chosen sustainable challenges of their environment, which had an stimulating effect on their engagement and the awareness on their capacity to act in their proximal environment. The participants complete the workshop having developed a higher feeling of self-efficacy and increasing their transformative agency in connection with the SDGs. Participants declaire to feel more able to play their full role as actors in society, thinking that what has been achieved collectively through games may well be possible in real life. However, the objective of developing critical thinking among young people on this topic cannot be fully achieved through activities that last only half a day. While their awareness on the capacity to act (transformative agency) is developed, their critical thinking on SDGs requires a longer time to be achieved. The duration of the actions proposed to participants during the half day's workshop require to be extended in order to ensure a more in depth discussion on the complex relations engaged in decision-making related to the SDGs.

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THEME 3.
POLICIES, PLATFORMS AND NETWORKS TO ACHIEVE THE SDGs

Citizen Science platforms as a way to impact on the SDGs

Format: 5-minute introduction by the moderator + 4 speakers with 10-minute presentation each + Q&A.

Session chair:
Colombe Warin | European Commission, Research Executive Agency | Colombe.WARIN@ec.europa.eu
(session organised by EU-Citizen.Science)

This session will focus on the importance of sharing knowledge, training materials and resources about citizen science, and of taking stock of the experiences of national platforms as a way of working towards the SDGs. It will also consider the multiplier effect of having one central platform at the European level, EU-Citizen.Science, and the importance of platforms in international collaborations towards the SDGs.

KEYNOTE

The Crowd4SDG Project and the Citizen Science Solution Kit
François Grey

Short CV

I am a physicist with a background in nanotechnology, and a passion for citizen science. At the University of Geneva, I run Citizen Cyberlab, a partnership with CERN and the UN Institute for Training and Research where we develop and study new forms of public participation in research.
Topic: Based on expertise in crowdsourcing for disaster response, the Crowd4SDG project is researching how artificial intelligence can enhance citizen science projects involving non-traditional data sources such as social media, in order to provide effective monitoring of SDG indicators by citizens, and to stimulate grassroots innovation for tackling the SDGs.

Abstract

Launched in May 2020, in the middle of the coronavirus pandemic, the Crowd4SDG immediately applied a grassroots innovation methodology called the GEAR Cycle to the Covid crisis. The methodology involves the use of a range of digital tools called the Citizen Science Solution Kit. We will describe how the GEAR cycle works, and some of the tools available in the Solution Kit. In October 2020, Crowd4SDG will launch a crowdsourcing innovation challenge on SDG 13, Climate Action, to explore new ways of applying citizen science for monitoring and mitigating the effects of extreme climate events. Some examples will be shared of how tools from the Solution Kit can help achieve these goals.

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PRESENTATIONS

Assessing the impact of citizen science towards Sustainable Development Goals: The coordinators' point of view
***James Sprinks, Sasha Woods, Stephen Parkinson, Uta Wehn, Hannah Joyce and Luigi Ceccaroni**

Successfully tracking progress towards the United Nations Sustainable Development Goals (SDGs) requires high-quality, timely and accessible data, often in areas where little data is currently available. Current baselines and indexes developed for the measurement of SDG progress rely on data from formal international and national bodies, resulting in limitations due to socio-economic variations between countries and the qualitative nature of certain indicators in their definition. In response to such limitations, there has been a recent movement towards a bottom-up approach, focused on capacity building rather than the development of a global framework. Citizen science is one such method, with the potential to make contributions both in terms of data collection and analysis, and with regards to public engagement, generating the societal changes needed to make SDGs attainable. Consequently, citizen science has been found to have the potential to contribute to several SDGs. However, whilst the links between SDGs and their associated indicators and the potential of citizen science to contribute towards them is well documented, limitations still exist when attempting to measure the impact that citizen science initiatives have made toward SDG progress. There is no single, best practice approach to impact assessment currently in use by the citizen-science community, with the need for a combination of data collection methods often stretching the expertise and capacity of citizen-science practitioners. To better understand both the issues and prospective solutions surrounding impact assessment towards SDG progress, this work presents the outcomes of semi-structured interviews with citizen science project coordinators. Performed as part of the Horizon 2020 MICS project (www.mics.tools), they reveal the complex nature of impact assessment within a citizen science context. A number of different methods of impact assessment are used that differ in terms of timing and structure, for a range of purposes from proposal stage planning to gaining insight during and after project activity. Challenges do exist however, relating to the definition of impact; funding and project timelines versus the manifestation of longer-term impacts; data collection issues; project priorities; lack of expertise; and the lack of capacity – all that vary depending on the SDGs involved.

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Citizens create knowledge: The networking platform for Citizen Science in Germany
Nicola Moczek, Florence Mühlenbein and *Susanne Hecker

The German networking platform buergerschaffenwissen.de (citizens create knowledge) has been operated jointly by

the Berlin Museum of Natural History and Wissenschaft im Dialog since 2014 and is financially supported by the German Federal Ministry of Education and Research. At the moment, over 145 citizen science projects which are carried out in Germany invite citizens to research. In addition, the platform uses various offers to promote capacity building and networking between the actors. An internal analysis shows that all of the projects help to make participants aware of sustainable issues and enable diverse learning opportunities for different target groups (goal 4) and empower individuals to act sustainably. 63 of the projects can be assigned to goal 15 (Life on Earth; 13 explicit to biodiversity; 43 to animals, 20 to plants). Another 27 projects can be assigned to goal 11 (sustainable cities and communities), 15 to goal 13 (climate action) and 12 to goal 14 (life below water), just to name the most frequent ones. (Note: a project can be assigned to more than one goal, so they add up to over 145). A survey of all projects on the platform, starting in July, will provide further insights into the project structures and in particular will ask information on the type and scope of the data and the data quality. In the talk, the main results of the survey are presented and success factors as well as challenges are discussed. Currently, it remains open to what extent the collected data is currently used by higher-level authorities to measure the indicators of the SDG. So we'll focus on the potential of the German citizen science projects to use their data to support monitoring, define national and subnational targets and help to implement action (according to West & Pateman, 2017).

References

West, S., Pateman, R., 2017. How Could Citizen Science Support the Sustainable Development Goals? Stockholm Environment Institute. https://www.sei.org/publications/citizen-science-sustainable-development-goals/Citizens create knowledge

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CS-Track database: a central database of CS projects in Europe that can be key to understand the connection of CS and SDGs

***Patricia Santos, Miriam Calvera-Isabal, Laia Albó, Julia Lorke, Ulrich Hoppe and Davinia Hernández-Leo**

CS Track (https://cstrack.eu/about/), launched in December 2019, as part of the SwafS-H2020 call aims to broaden the existing knowledge about Citizen Science (CS). One main objective is the development of one central database to compile a comprehensive collection of CS projects, mainly visible on the Web, in the European Union and Associated Countries as complete as possible. In order to obtain data from CS projects, key national CS platforms have been analysed using web scraping extraction techniques. Additionally, we will contact experts to find information about projects not visible on the Web. The CS Track database opens a new perspective on CS knowledge by observing and characterizing initiatives through a quantitative approach that relies on web-based and social-network analytics (Hoppe, 2017). We have followed the required fields proposed by Cavalier et al. (https://www.wilsoncenter.org/article/ppsr-core-metadata-standards) to extract metadata from CS platforms but not all the required fields are found in all the platforms. So far our analysis has already extended the number of platforms from 4 (as analyzed by Cavalier et al. 2015) to a total of 37 CS platforms. The resulting datasets will contain information associated with CS projects like: type of actors, topics of interest, categories of projects by region, aspects related to education. This is a very valuable and innovative data source (Fritz et al, 2019) that can be used to understand the connection and impact of CS on Sustainable Development Goals (SDGs). For instance by tracking and monitoring which CS projects contribute to SDG topics such as: Clean water and sanitation (SDG6), Climate action (SDG13) or Life on land (SDG15). Or to understand how the educational resources from CS activities can be collected to support the goal of Quality Education (SDG4). In conclusion, the CS Track database will show the current panorama of CS in Europe and have the potential to help different social agents, e.g. policy makers, CS organizers, educators, so that they can integrate and promote SDGs through citizen science to improve their integration into our society.

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THEME 3.
POLICIES, PLATFORMS AND NETWORKS TO ACHIEVE THE SDGs

Citizen Science Policy – A panel discussion

Format: Panel discussion & hot chair.

Session chairs:
Aletta Bonn | Helmholtz-Centre for Environmental Research – UFZ, Friedrich Schiller University Jena and German Centre for integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig | aletta.bonn@idiv.de
Susanne Hecker | Museum für Naturkunde – Leibniz Institute for Evolution and Biodiversity Science, Germany | susanne.hecker@mfn.berlin

The panel discussion will engage high-level experts from policy, science and museums as science-society interfaces at the national and EU level. We will debate how citizen science can provide building blocks for attaining SDGs policy goals, and discuss what opportunities and challenges exist for policy and science funders to support citizen science. The audience will have the opportunity to engage with panellists through a ‚hot chair' session. As an outcome, we hope to elicit a vision for fostering citizen science and SDGs into 2030.

PANELLISTS

- Michael Meister | State Secretary, Federal Ministry of Education and Research (BMBF), Germany
- Signe Ratso | Deputy Director-General, DG Research and Innovation, European Commission
- Katrin Vohland | Director at the Natural History Museum Vienna, Austria
- Muki Haklay | rofessor of Geographic Information Science, University College London (UCL), UK
- Klement Tockner | President FWF Austrian Science Fund, Austria

SHORT CVs

Session chairs

Aletta Bonn is Professor of Ecosystem Services and Head of Department at the Helmholtz-Centre for Environmental Research – UFZ, the Friedrich Schiller University Jena and the German Centre for integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig. Founding Directorate Member of the European Citizen Science Association (ECSA), PI for the 'GEWISS - BürGEr Schaffen WISSen' project (2014-17) in collaboration with the Museum für Naturkunde Berlin and several Helmholtz, Leibniz and university research organisations, she currently leads several citizen science projects, the CitizenScience@Helmholtz network and the collaborative development of the white paper Citizen Science Strategy 2030 for Germany.

Susanne Hecker is a member of the Board of Directors of the European Citizen Science Association (ECSA). She is currently a member of the steering group for the strategic development of the White Paper Citizen Science Strategy 2030 for Germany. In her research, Susanne focuses on questions at the science-society-policy interface of citizen science. Susanne is actively involved in the global citizen science network through several scientific and capacity building collaborations. Since 1st October she is leading the German citizen science platform Bürger schaffen Wissen at the Museum für Naturkunde in Berlin in collaboration with Wissenschaft im Dialog.

Panellists

Michael Meister holds a doctorate in mathematics and has been a member of the German parliament, the Bundestag, since 1994. From 2002 to 2004 he was chairman of the finance working group of the CDU/CSU parliamentary group in the Bundestag. Subsequently, until the end of 2013, he served as deputy chairman of the CDU/CSU parliamentary group, where his responsibilities included fiscal and budgetary policy. From December 2013 to March 2018 he was State Secretary at the Federal Ministry of Finance. Since March 2018, Meister has held the position of State Secretary at the Federal Ministry of Education and Research.

Signe Ratso is Deputy Director-General and a member of the Management Board of the Directorate General for Research and Innovation of the European Commission. She is the Chief negotiator for Horizon Europe Association. She is also responsible for Open Innovation and for citizens' engagement in research and innovation policy and for overall coordination on international cooperation. Signe Ratso joined DG Research and Innovation as Deputy Director General on 1 March 2018. In this function her particular areas of responsibility included International Cooperation in Research and Innovation as well as R&I in Industrial Technologies and in the area of Transport until 1 June 2019. Before joining DG RTD she worked in different senior management positions in DG TRADE since 2006. From 2011 to 2018 she

was Director for Trade Strategy, Analysis and Market Access in DG TRADE. Previously (from 2007 to 2011) she was Director for WTO, legal matters and food-related sectors in DG TRADE, covering OECD issues, export credits and export controls of dual use goods. After joining the Commission at the beginning of 2006, she held the post of Principal Adviser in DG TRADE for the first year. Before joining the Commission Signe Ratso worked as Deputy Secretary General (from 1994 to 2005) at the Ministry of Economic Affairs and Communications of the Republic of Estonia. In this position she was responsible for all EU-related issues in the following policy areas: trade and industrial policy, energy, transport, telecommunications, information society, internal market affairs. During Estonia's accession negotiations she was responsible for negotiating 6 economic chapters. She has two University degrees. In 1983 she graduated from Tartu University in Estonia as an English philologist, in 1993 in International Trade and International Economics.

Katrin Vohland is Director General of the Naturhistorisches Museum (NHM Vienna) since June 2020. Before, she headed the Research Department "Museum and Society" at the Museum für Naturkunde Berlin, Leibniz Institute for Evolution and Biodiversity Research. Her main research interest is in the interface between science – especially biodiversity science – and different public audiences. She was active in the German Network for Biodiversity Research (NeFo) and investigated how scientific knowledge can be mainstreamed into policies as in the case of IPBES (Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services). Katrin is very active in developing citizen science as an integrative approach in Germany and Europe. She initiated the German citizen science platform including the development of quality criteria, she is chair of the European scientific network of the COST Action "Citizen Science to promote creativity, scientific literacy, and innovation throughout Europe", and she was vice-chair of the European Citizen Science Association (ECSA).

Muki Haklay is a Professor of Geographic Information Science at University College London (UCL). He is the founder and Co-director of the UCL Extreme Citizen Science group, which is dedicated to the development of technologies and methodologies to allow any community, regardless of their literacy, to use scientific methods and tools to collect, analyse, interpret and use information about their area and activities. The group has developed a range of technologies that can be used for participatory science and mapping, including the Sapelli data collection suite, and the GeoKey framework for the capture and management of participatory mapping information. In addition he is co-founder and director of the social enterprise 'Mapping for Change', which provides services in participatory mapping and citizen science. He was an inaugural board member of the Citizen Science Association, and is the co-vice chair of the European Citizen Science Association. He has extensive experience in citizen science projects, including EveryAware (FP7 FET), Citizen Cyberlab (FP7 ICT), WeGovNow! (H2020 CAPS), Doing It Together Science and EU-Citizen.Science (H2020 SwafS), and ECSAnVis (ERC Advanced Grant).

Klement Tockner is president of the Austrian Science Fund (FWF), full professor for Aquatic Ecology at the Freie Universität Berlin, head of the Austrian Agency for Research Integrity, and former director of the Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin. He received a PhD in zoology and botany at the University of Vienna and a Titulary Professorship at ETH. He is an internationally leading freshwater ecologist in the research domains biodiversity, ecosystem science and environmental management. He has successfully managed large inter- and transdisciplinary projects such as the EC-funded project BioFresh, and co-led the EU-Erasmus Mundus joint doctorate program SMART. Klement Tockner is member of several international scientific committees and advisory boards such as the National Institute for Environmental Studies (NIES, Japan) and the Biology Centre (Czech Republic) and elected member of the German National Academy of Sciences, Leopoldina, and the Austrian Academy of Sciences.

THEME 3.
POLICIES, PLATFORMS AND NETWORKS TO ACHIEVE THE SDGs

Who is engaged in Citizen Science – and who could or should be?

Format: 10-minute presentation + 5-minutes Q&A each keynote; 5-minutes presentation each presentation + 15-minutes panel discussion.

Session chair:
Jens Jetzkowitz | Museum für Naturkunde Berlin | Jens.Jetzkowitz@mfn.berlin

Citizen science is an established approach in the scientific landscape, and one that is intentionally used for many purposes: developing novel ways to conduct research and innovation, collect and analyse data, empowering citizens to participate with their own ideas in the democratic knowledge society, and communicating principles of scientific thinking to non-academics. To sharpen our understanding of the potential, but also the limitations, of citizen science, this session will bring together speakers to compare normative claims with factual circumstances, and discuss which groups in society are active in citizen science, and which are not. Answers to these questions will lead us to a differentiated assessment of the goals citizen science projects can achieve.

KEYNOTES

Underrepresented audiences and exclusion factors in science communication
Philipp Schrögel

Short CV

Philipp Schrögel is a science communication researcher at KIT in Karlsruhe with a focus on creative, participatory and inclusive approaches. He holds a physics diploma from FAU Erlangen-Nuremberg and a master in public policy from Harvard University.

Abstract

Various parts of society are not reached by the established forms of science communication, public engagement or citizen science alike. The challenge for equitable participation is increasingly addressed in research and practice. However, a comprehensive overview of underserved audiences and broader empirical evidence is lacking so far. Practical approaches and theoretical works often focus on certain aspects or areas of exclusion. Furthermore, the heterogeneity of the underserved audiences makes it difficult to define concrete groups that are left out or discriminated against. Often, it is a combination of different factors and practices of engagement with communication that lead to marginalization. The keynote talk will give an overview on current studies addressing the audiences of science engagement and introduce a typology of exclusion factors developed in the project "science for all" as well as present some theoretical thoughts on the inclusive shaping of participation, engagement and openness.

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Infrastructures of in/exclusion in Citizen Science: organisations, networks and policies
Claudia Göbel

Short CV

Claudia Göbel is a social scientist and practitioner in the field of open participatory research. Her background is in science and technology studies. She works on open organisations, research policy and equity in Citizen Sciences at HoF Halle-Wittenberg and Museum für Naturkunde Berlin.

Abstract

Diverse communities of practice are key to generate knowledge for change - as truly innovative and transformative Citizen Science. My contribution seeks to look beyond the individual level to understand structural influences on participation. What role do research organisations, Citizen Science networks and the design of policies have for inclusion and exclusion? I will present reflections from my practical work and research with the European Citizen Science Association, where I co-lead the working group on equity and inclusion. Key aspects concern the involvement of civil society organisations in Citizen Science activities, inclusive events and spaces of exchange between neighbouring communities of practice.

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PRESENTATIONS

Participation in citizen science and the SDGs in low and middle income country cities
***Rachel Pateman, Heidi Tuhkanen and Steve Cinderby**

The battle for sustainability will be won or lost in cities, where problems related to pollution and climate change are particularly acute. Urban environments in low and middle income countries present additional environmental and social challenges, including from the impacts of unplanned development. The United Nations' Sustainable Development Goals (SDGs) include, for the first time, a goal focused on cities, as well as numerous other goals relevant to urban environments, such as those focusing on poverty, health, and access to water and sanitation services. Progress towards the SDGs is monitored with a set of targets and indicators. Gaps in official datasets used for monitoring have led to calls for the inclusion of non-traditional data sources, including data generated through citizen science (CS) and allied approaches. Co-benefits of CS for participants (e.g. as a means of education or development of skills), partnership building and decision-making at a range of scales, mean these approaches can also be a means of achieving the SDGs. However, how inclusive are these approaches? The

SDGs aim to "leave no-one behind" but who is participating in these projects and, therefore, who is receiving the benefits, how representative are the data collected and how inclusive is subsequent decision-making? Here we use information from a systematic review of the academic and grey literature which identified projects collecting and using citizen-generated data in urban environments in low and middle income countries. We explore in which countries projects are taking place and, within these projects, who is participating. We discuss the potential impacts on biases in participation for the objectives of these projects (e.g. in monitoring environments or informing urban planning). We supplement this information with findings from interviews with citizen science project leaders to explore the challenges related to engaging participants. We finish by making suggestions for how these challenges can be overcome.

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Democratizing science by Citizen Science: a realistic claim?
***Michael Strähle and *Christine Urban**

Involving publics and stakeholders in research or science policy is nothing new, not even crowdsourcing is. Mainly due to modern ICT, we saw new forms of public engagement in the sciences in the past 20 years. The normative claim that involving citizens in scientific research democratizes the sciences is relatively new. Science shops, community-based research practitioners, and others made, respectively make, this claim, with Citizen Science associations being the most recent ones. This claim goes hand in hand with another one: that involving citizens in research is beneficial for all participants and the sciences and society at large. Aside from "a litany of engagement case studies and evaluations" (Irwin 2014) - an assessment we can fully confirm - there is meagre empirical evidence of the impact Citizen Science projects and public engagement in the sciences in general have (for exceptions see Dosemagen et al. 2019, Tang et al. 2019 e.g.). To make things worse, these case studies are often presented by those who conducted the projects. Notwithstanding there are self-reflective studies available (e.g. Sunde et al. 2014), a view from the outside and an assessment across projects, let alone different parts of the world, is conspicuously rare. The Horizon 2020 project "Expanding our knowledge on Citizen Science through analytics and analysis" (CS Track) aims at narrowing this knowledge gap by investigating Citizen Science projects in respect to enablers and barriers these projects face, tasks conducted by volunteers and professional scientists, costs and benefits, ethical and integrity issues in Citizen Science, and the way in which participants collaborate, among other aspects. In particular this includes a perspective across projects and different parts of the world, including the Global South. In their presentation the authors will briefly present first results and critically discuss especially some frequent assumptions and generalizations about the volunteering citizens (individuals or NPOs), the frequent general claim that Citizen Science democratizes the sciences, ethical and integrity issues, and how all this is linked to each other.

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Matthew Effects in Citizen Science
***Stefan Reichmann, Ilaria Fava, Thomas Klebel and Tony Ross-Hellauer**

Socially inclusive forms of knowledge production form a core element of Open Science. Drawing on earlier approaches such as transdisciplinary research, public engagement and Citizen Science (CS) Open Science continues a long-standing agenda of participatory research (Chesbrough 2015) to suggest that participation in research fosters democratisation (Mirowski 2018). Civil society actors and other societal stakeholders not only benefit from open access to scientific outputs (Tennant, Jacques, Collister et al. 2016) but, crucially, represent resourceful contributors to processes of knowledge production. Therefore, CS furthers public engagement throughout scientific knowledge production (Vicente-Saez and Martinez-Fuentes 2018). Citizen science could also facilitate dialogue between science and society (Leonelli, Spichtinger, and Prainsack 2015). However, some (e.g. Mirowski 2018) argue that all CS does is entice non-scientists to perform remote data processing labor under the guise of purported democratisation of science; cheap labor at best, deskilling of trained scientists at worst. Instead of contributing towards equity, responsible research practices as CS might worsen existing inequalities. In this contribution, we question whether CS holds up to its promise of a more inclusive science and society by asking which groups are most likely to participate in Citizen Science projects and how. The contribution builds on Merton's (1968) idea of the Matthew effect, a dynamic of cumulative advantage where already powerful individuals/institutions accrue a disproportionate amount of rewards. Since then, studies have identified many ways in which effects of cumulative advantage in research play out at the level of article citations, journals, institutions, departments, and countries, as well as the individual attributes of researchers. These effects operate across a range of scientific activities, including peer review, funding acquisition, and public engagement. Matthew Effects might be at play in the (self)selection of Citizen Scientists. We will introduce the concept of the Matthew effect based on examples from academia, discuss the ways these issues are currently being addressed in the ON-MERRIT project, and ask participants to discuss their experiences with CS projects and possible (demographic) Matthew Effects. Which groups are active in Citizen Science, why, and which are not? What are possible implications for the potential of CS?

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THEME 3.
POLICIES, PLATFORMS AND NETWORKS TO ACHIEVE THE SDGs

Partnerships towards the goals – Making sustainable change sustainable with Citizen Science

Format: Keynote presentation, 10-minute presentations from the call each + discussion.

Session chair:
Jörn Knobloch | Museum für Naturkunde Berlin | Joern.Knobloch@mfn.berlin

A combination of scientific knowledge, governance and institutional changes, socially inclusive participation, and close international collaboration and mutual learning is required for the sustainable transformation to a sustainable society. Citizen science has the potential as a best practice solution for this process. The characteristics of citizen science as a mode of social self-enlightenment allows it to anchor the knowledge needed for change and to increase the public support of social transformation. To secure this in the long term, a shared framework for equal cooperation must be developed, in cooperation with other R&I stakeholders such as public authorities, businesses and industry, and research and academic institutions. The session will outline the conditions as well as future directions of this framework and address critical issues, such as the tension between autonomy and use of citizen science, the mediation between scientific independence and participatory expectations, and the benefits of an open science policy.

First insights into the survey: The contribution of European Citizen Science projects to the UN sustainable development goals (SDGs)

***Nicola Moczek, Silke Voigt-Heucke, Kim Mortega, Claudia Fabó Cartas, Jörn Knobloch**

The contribution of citizen science to the achievement of the SDGs has become a hot topic in current research. In recent published papers, three key aspects have been examined in more detail. First, the current and potential contributions of citizen science to the SDGs on the level of the goals and/or indicators (Fraisl et al., 2020; Schleicher & Schmidt, 2020), second, data acquisition and sharing and complementing of traditional sources with data from citizen science projects (Fritz et al., 2019; Fraisl et al., 2020) and third, the fields of action in which citizen science projects can provide significant impetus for achieving the SDGs (Sauermann et al., 2020; West & Pateman, 2017). The articles provide very valuable analyses, but could not build on empirical data and information from the project participants themselves. This should be supplemented by our online-questionnaire. The survey was open from 7/29 to 10/4/2020. In total, 125 entries from all over Europe could be analysed. Goal 3 (Good health and well-being), Goal 4 (Quality education), Goal 15 (Life on Land) and Goal 11 (Sustainable cities and communities) were the ones where projects actively contributed the most. In addition, there is evidence of good to very good potential to support all goals in future. 72% of the projects are involved in monitoring (collecting, processing and making data available) and already 30% share data and information with authorities (municipality, federal or state), but 19% do not pass on data and 34% 'do not know'. Only one project shares data with one of the UN databases. Consequently, 55% ask for assistance on how to contribute to data collection, monitoring and analysis that is useful to the achievement of the SDGs and 50% on how to report data to responsible authorities and/or United Nations databases. Whereas the actual and future contributions to the goals were partially surprising and deviate from previous analyses, we found strong evidence that projects should receive more support to adapt or extend their data collection and data management (according to Fraisl et al., 2020). Based on these results, we aim to develop a new approach to facilitate the development of new partnerships. We will focus on the UN databases that have the greatest potential in terms of benefiting from citizen science data.

References

Fraisl, D., Campbell, J., See, L. et al. (2020). Mapping Citizen Science contributions to the UN sustainable development goals. Sustainability Science. Available at https://doi.org/10.1007/s11625-020-00833-7 [last accessed 17 August 2020].

Fritz, S., See, L., Carlson, T. et al. (2019). Citizen Science and the United Nations Sustainable Development Goals. Nature Sustainability, 2, 922–930 (2019). Available at https://www.nature.com/articles/s41893-019-0390-3 [last accessed 17 August 2020].

Sauermann, H, Vohland, K., Antoniou, V. et al. (2020). Citizen Science and sustainability transitions. Research Policy, 49, 103978. Available at https://doi.org/10.1016/j.respol.2020.103978 [last accessed 17 August 2020].

Schleicher, K. & Schmidt, C. (2020). Citizen Science in Germany as Research and Sustainability Education: Analysis of the main forms and foci and its relation to the Sustainable Development Goals. Sustainability 2020, 12(15), 6044. Available at https://doi.org/10.3390/su12156044 [last accessed 17 August 2020].

West, S. & Pateman, R. (2017). How could Citizen Science support the Sustainable Development Goals? Policy brief. Stockholm Environment Institute. Available at https://www.sei.org/publications/citizen-science-sustainable-development-goals/ [last accessed 17 August 2020].

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Creating Sustainable cities in partnership: Investigating nature-based solutions through citizen science

***Macarena Cardenas, Toos van Noordwijk and Steven Loiselle**

As the number of people working and living in cities increases, the quality and quantity of urban nature is both under pressure and of increasing importance to people's health and wellbeing. Identifying this challenge, in 2017 Earthwatch Europe created the Sustainability Training programme (STP), inspired in the UN's SDGs and with

special focus on SDG11: 'Sustainable Cities and communities'.Hosted in 17 major cities from 8 countries, STP was a two-day programme including education and citizen science, aiming to bring awareness to business and their employees about the current environmental challenges of urban areas and the benefits of green spaces and waterbodies for urban climate resilience. Citizen science was used to examine nature-based solutions (NbS) as a tool to support urban resilience. Examples of NbS studied were urban trees, wetlands and bioswales, confronting challenges such as water pollution and extreme weather events. The programme also engaged communities, policy makers and scientists to raise awareness and build scientific knowledge about the impacts and solutions of climate change. This presentation will cover the complex process of creation, challenges and successful results of the partnership with business for the STP programme. We highlight the close collaboration required for developing business-relevant and scientifically sound projects using citizen science investigating local environmental issues with other 20 scientific institutions worldwide. The exceptional results obtained include an 86% of participants (1,876 in total) reporting an increase in their understanding of climate change and urbanisation, and 76% of participants reporting increased confidence to take environmental sustainability actions at work and at home. The results of citizen science projects are bringing specific and optimistic new evidence of how NbS can provide sustainable solutions to urban environmental challenges such as water pollution, urban heat island effect, flooding and soil health. The STP demonstrates the powerful role of partnership at international level to support a sustainable future, through the transformative result of citizen science and education. Altogether, STP directly contributed to sustainable cities and communities (SD11), to increasing knowledge and skills (SDG4), improving information for better freshwater management (SDG6), supporting life on land (SDG15), and supporting urban climate change resilience (SDG13).

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Best Practices in Citizen Science for Environmental Monitoring

***Kim De Rijck, José Miguel Rubio Iglesias, *Sven Schade and Marjan Van Meerloo**

A growing number of citizens worldwide are getting involved in collecting and reporting scientific information and observations about their surroundings through citizen science initiatives. Many of these projects are producing valuable data about environmental phenomena. There is significant potential for public authorities to make more use of this valuable source of knowledge, and for citizen science to have a greater impact on policy, such as the European Green Deal and other EU and global priorities like the United Nations sustainable development goals (SDGs). However, and while there are examples of uptake in some environmental areas (biodiversity, air pollution, waste/litter), obstacles related to data quality and complexity of data requirements seem to be holding back a wider use of this potentially policy-relevant information. Therefore, and building on a EU-wide inventory of practices with an analysis of their contribution to SDGs, an extensive stakeholder consultation, and in collaboration with the European Environment Agency, the European Commission has prepared the document "Best Practices in Citizen Science for Environmental Monitoring". This document summarizes the opportunities for and benefits of using citizen science for environmental monitoring, highlights good practices and lessons learnt, and identifies the obstacles preventing its broader uptake. It also puts forward recommendations and possible actions for the various actors in the field (public authorities, citizen science networks and communities, researchers/academics) to facilitate and enhance the use of citizen science in environmental monitoring. These recommendations are clustered around four areas: match-making between knowledge needs and citizen science, promoting awareness, promoting standards for data quality and interoperability, and supporting coordination, cooperation and resources for policy impact. Possible actions include supporting existing and new initiatives in environment policy areas under the Green Deal, promotion of availability of citizen science data on open platforms and communication of data quality requirements and methodologies in close cooperation with inter alia statistical offices. The talk will therefore present the context and content of this work, with a focus on its relevance for EU and global policies such as the SDGs, in order to stimulate a discussion on a more systemic integration of citizen science into environment-related policy.

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Drinkable Rivers - Citizen Science as a tool for the involvement of the local community in monitoring water quality of the Douro River

Ana Peso, *Maria Vicente, Paulo Jorge Lourenço, Ana Faustino, Catarina Seabra, José Varela, Filipe Pinto, Carlos Martins and Pedro Russo

The county of Figueira de Castelo Rodrigo (FCR), in particular the village Barca D'Alva, is the location of the last Portuguese pier on the route of the tourist cruises that navigate the Douro river. In 2019, this was the entry point for over 130,000 tourists from across the globe. Such touristic pressure has been causing an impact on urban waste management and on the pollution of watercourses due to discharges of wastewater and fuel. Considering the lack of scientific evidence that links river tourism to the level of water pollution in Barca D'Alva, the Plataforma de Ciência Aberta - Municipality of FCR (plataforma.edu.pt) integrated the Drinkable Rivers (DR) citizen science project. The DR network, led by a group of citizens, the WaterLab - University of Technology Delft and Wageningen University and Research, currently includes 32 local hubs in 14 countries across Europe that monitor the water quality of 37 rivers. To understand how the water quality of the Douro river may be impacted by river tourism (SDG#14) and to raise

awareness towards the local community, we are carrying out river water analyses, at least once a month, to gather representative data of the high and low seasons of Douro cruises traffic. In each session, we collect samples from 7 sampling points, upstream and downstream of the pier, to measure a variety of parameters (e.g. water stiffness, nitrate and phosphate content and bacteria presence). So far, 8 analysis sessions have been held, involving 74 participants, including school and local community, firefighters and policy makers. The results can be found in the DR's website (drinkableriv-ers.org). This initiative has attracted great interest from the national press. To ensure sustainability of this citizen science project as well as scientific impact, we are currently establishing partnerships with Portuguese academic institutions and research groups working on water quality. In the future, we want to create a regional network of water quality hubs in collaboration with municipalities along the Douro river, and establish an evidence-based dialogue with the companies operating river cruises to reduce the environmental impact of tourism on the Douro River ecosystems.

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THEME 3.
POLICIES, PLATFORMS AND NETWORKS TO ACHIEVE THE SDGs

Opening Social Science & Humanities research towards society: Required institutional settings

Format: 15-minute input presentation + 45-minutes panel discussion with three speakers from CSS initiatives.

Session chairs:
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Susann Hippler | Institute of Higher Education Research at the University of Halle-Wittenberg (HoF) | susann.hippler@hof.uni-halle.de
(session organised by SoCiS)

What roles does citizen science in the social sciences and humanities have for working towards the SDGs? This session focuses on the organisational settings in which Citizen Social Sciences take place. We are interested in cooperation between different stakeholder groups, especially between scientific institutions and civil society. Such cooperation is important for addressing the SDGs, but how does this work in practice? Which analytical concepts are needed? By bringing together research results and experiences of practitioners, we seek to provide an empirical basis for discussing success factors and challenges for addressing the SDGs through Citizen Social Sciences.

KEYNOTE

Citizen Social Sciences and its institutional settings

***Justus Henke, *Claudia Göbel and Sylvi Mauermeister**

Short CV

The three researchers work in the SoCiS project that examines the German landscape of Citizen Science in the social sciences and humanities – Citizen Social Science. SoCiS is run by the Institute of Higher Education Research at the University of Halle-Wittenberg (HoF) and funded by the German Ministry for Education and Research.

Abstract

The talk opens the session with results of the 2-year research project SoCiS. The project conducted a landscape study of Cit-

izen Science in the social sciences and humanities in Germany. We will introduce the concept of Citizen Social Science and then examine the institutional settings of such activities. We focus on preconditions necessary for the participation of non-professional researchers and organisations external to the scientific system in research activities. We also ask what innovation potentials are linked to Citizen Social Science and how they relate to the SDGs. From our findings, we'll draw key questions for the panel discussion that follows.

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PRESENTATIONS

Citizen social science for sustainable cities and health in the Act Early Preventative Research Programme

Alexandra Albert

The health and wellbeing of communities is influenced by a complex interplay of individual, interpersonal, community, organisational, cultural and societal factors [Barton and Grant, 2006]. Within the UK there is a clear health inequality gap with better health in more affluent communities, and poorer health in more deprived communities [Public Health England, 2017]. Often interventions to improve health and wellbeing focus on individual determinants of behaviour and ignore the wider systems level influences at play which constrain the ability of individuals to engage in health enhancing activities [Smith and Petticrew, 2010]. ActEarly UK-PRP is a prevention research programme that builds on city testbeds to support identification, implementation and evaluation of upstream early-life interventions within a whole system setting [Wright et al., 2019]. The ActEARLY initiative brings together a consortium of researchers, policy makers and communities from Bradford and Tower Hamlets, London to develop innovative interventions to improve population health. The vision is to promote a healthier, fairer future for children living in deprived areas through a focus on improving environments that influence health in the broadest sense, and enhancing life opportunities focusing on three key areas: healthy places, healthy learning and healthy livelihoods. ActEarly is committed to genuine co-production with users in order to achieve acceptable, feasible, replicable, and sustainable systems interventions with real impact. The consortium is engaging policymakers, third sector organisations and the public (especially young people and their families) using citizen social science methods of community engagement and prioritization in an asset-based community development approach [Kretzmann and McKnight, 1996] to sustainable community-driven change. Citizen social science can be an excellent tool to facilitate co-production of changes to local environments with the aim of improving health. We have already identified synergies between community needs, policy and decision maker, and other user group priorities across our programmes and sites, for example: safer streets (places), healthy vending options in school (learning), easier access to welfare advice (livelihoods). ActEarly provides a crucial empirical basis for exploring how citizen social science works in practice, and for discussing the success factors and challenges for addressing the SDGs.

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Building a participatory network for research on social support in mental health: cooperation, mission-oriented research and actionable insights

***Anna Cigarini, Isabelle Bonhoure, Itziar Gonzalez and Josep Perelló**

The role of citizen science in the social sciences and humanities is yet to be explored thoroughly. Within the frame of H2020 SwafS project CoAct (Co-designing Citizen Social Science for Collective Action) which is proposing a radically new approach to face four "wicked" social global issues by engaging vulnerable citizens acting as in-the field competent co-researchers, we describe the process and methodology we implemented when building a participatory network for research on mental health support networks, and the main characteristics of the network generated. One of the key challenges in mental health research, recovery and management lies indeed in acknowledging the value of social support networks and in incorporating civil society into decision making, crucial issues when trying to build resilient communities, at the crossroads of SDG3, SDG5, SDG10 and SDG16. New scientific, technical and deliberative methodologies are needed. Citizen science in its most co-created format and closeness to citizens' lived experiences - which we refer to as Citizen Social Science - can provide opportunities for civil society organizations, public administrations and scientific institutions altogether, to define, investigate, and address pressing issues of concern to them. Citizen Social Science gives civil society organizations, public administrations and scientific institutions an equal 'seat at the table' through active participation in research, from the design to the interpretation of the results and their transformation into concrete actions. We argue that Citizen Social Science may thus lead to more sustained forms of collaboration between civil society organizations, public administrations and scientific institutions, working towards the SDGs. Such an approach allows for addressing pressing social issues from the bottom up, embedded in local contexts, with robust research methods. Yet, based on our practical experience when building a participatory network for research on mental health, we highlight three main requirements to address the SDGs through Citizen Social Sciences: (i) A cooperative methodology and co-creation approach that recognizes the diversity and complementarity of the expertises involved; (ii) a mission-oriented and hands-on research, that builds on novel institutional and organizational paradigms; (iii) actionable outcomes at the individual, local, regional, national and international levels, related to specific SDGs indicators.

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beyond citizen science? the ars electronica research institute knowledge for humanity(k4h+)
Eveline Wandl-Vogt

throughout the centuries there were men
who took first steps down new roads
armed with nothing but their own vision.
[ayn rand]

k4h+ | knowledge for humanity hub is a brand new research institute established in ars electronica - futurelab in 09.2019, aiming to accelerate humanities knowledge into action. with it's antidisciplinary approach it intends to contribute to invent the future and re-think genres, applying open innovation in science methods and practices based on an RRI-mission statement. k4h+ applies exponential thinking against a background of humanities in open and experimental discovery processes, furthering cognitive, creative, interpersonal, and intercultural skills. It aims to work towards social innovation, acting within the scenario of the sustainable development goals and agenda 2030. k4h+ aims to establish one of the central cornerstones of the open innovation research infrastructure, which has been designed in a multistakeholder process in 2017 led by the author at the austrian academy of sciences. k4h+ acts as a knowledge designer to enable and create cross-organizational, cross-sectoral knowledge partnerships of purpose and co-design and co-develop innovation networks, applying humanity centered design. In this presentation the author focuses on the organizational setting of k4h+, aiming to bridge the gap between academic knowledge on the one hand and applications on the other, addressing humanity centered design in a framework of the SDGs. She points to the certain role art and emerging technologies may play for addressing societal challenges and issues. Further, she introduces the open innovation research infrastructure and the main concepts that are creating the innovation platform with global partnerships and a network movement approach, the sandbox and playground for actors with diverse backgrounds. In a framework of various collaborative practices from team science to public participation in research, the author raises the question what type of organizations we need to meet future challenges and addresses as one of the answers, learning open organizations of the type of k4h+. She offers examples and learning materials developed in the framework already, addressing the SDGs.

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THEME 1.
ADDRESSING GLOBAL CHALLENGES

Citizen Science for health and well-being

1. Citizen Science in Environment Epidemiology: Setting the stage for co-created research projects in environmental epidemiology
***Fleur Froeling, *Florence Gignac, Gerard Hoek, Xavier Basagaña and Cities-Health Consortium**

Several citizen science initiatives in environmental science have been used to monitor civic concerns such as air pollution, noise pollution, water quality and odour nuisance to strengthen public health policies. However, citizen science projects in environmental epidemiology remain scarce as little attention has been paid to assess health effects directly. This paper was prepared using the Citizen Science on Urban Environment and Health (CitieS-Health) framework, an EU's Horizon 2020 programme funded project on citizen science in environmental epidemiology. This is one of the first attempts to set the stage for understanding and applying citizen science in environmental epidemiology. When investigating the possibilities for citizen science in environmental epidemiology many commonalities between citizen science and other participatory approaches applied in environmental health studies were recognized. A gap where citizen science can make a difference in the field of environmental epidemiology is by improving the democratization of scientific governance and sustainability of research projects. We believe that co-created citizen science, where citizens are invited to participate, engage and be involved in all phases of a research project, could contribute to the development of the latter in this field. This form of research provides benefits for both citizens and epidemiologists alike. Citizens' personal empirical and emotional experiences can provide in-depth knowledge about their immediate living environment, allowing for the development of more locally relevant studies. With the help of various frameworks, this paper also identifies challenges and opportunities specific to the implementation of a co-created citizen science in environmental epidemiology. Co-analyzing the association between exposure and health, and managing prior expectations of citizens about the outcome of a study, are examples of challenges that require epidemiologists to go beyond the traditional research framework and include outreach activities. Continued efforts, particularly the sharing of information about projects' collaborative processes, are needed to make citizen science a more concrete and cohesive approach in environmental epidemiology.

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2. Catch me if you can! Engaging the public in national mosquito monitoring
***Nadja Pernat, Helge Kampen, Jonathan M. Jeschke and Doreen Werner**

Management of vector-competent mosquitoes has become an important political and scientific issue throughout Europe as outbreaks of mosquito-borne diseases time and again appear in Mediterranean countries. In Germany, cases of West Nile fever in 2018 and 2019 have shown that mosquito-borne diseases can also become problems for countries in temperate zones. In order to make risk assessments and design targeted control measures, a nationwide mosquito surveillance programme was launched in 2011, complemented by the citizen science project 'Mückenatlas' one year later. In this low-threshold, analogue project, citizens are encouraged to catch and submit mosquitoes without any protocol or training - the only conditions are not to smash the insects and provide basic information of catch date and location. Every participant gets a personal written response with details about the catch and a marker on the website's collector's map if desired. The samples are analysed at the institute to ensure data quality and all corresponding information is uploaded to a nationwide mosquito database, resulting in an extensive dataset. In our talk, we present the contributions of the 'Mückenatlas' to mosquito research and risk management and illustrate that it is actually the recording behaviour of citizens that brings the true benefits of the project to light. We point out that due to our classic and reliable communication style the project is perceived as a competent contact point for the public. Nevertheless, the 'Mückenatlas' does not reach all socio-economic groups, as will be demonstrated, which would not only be socially desirable but would also fill important gaps in mosquito research.

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3. Harnessing the potential of Citizen Science for advancing air pollution related SDGs in Germany and Niger
Ibrahim Sidi Zakari and *Robert Lepenies

This contribution aims at highlighting the potential of Citizen Science (CS) as an approach for advancing air pollution related Sustainable Development Goals (SDGs). Air pollution is the most important environmental cause of premature death in Europe; at the same time, many african cities are facing rapid urbanization and areas with high traffic volumes coupled with high population densities are most at risk to air pollution levels that exceed the limits recommended by the World Health Organization. The fundamental research question is how CS can contribute to air pollution related SDGs in Germany and Niger?Authors experience and case studies will be shared around local SDGs implementation plans, progress and data gaps, small scale CS projects related to SDG 3, SDG 7 and SDG 11, technologies used for air quality monitoring, opportunities and challenges for upscaling, lessons learned and perspectives in terms of citizen engagement and policy making.

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4. A multidisciplinary Science Shop project on Hearing Impairments in Northern Tunisia
***Nadia Zitouna, Lotfi Ali Zekri, Jihène Marrakchi, Rahma Mkaouar, Hichem Ben Hassine, Ridha Mrad, Sonia Abdelhak and Lilia Beltaief**

Ichara is a Tunisian CSO who raises awareness for a better childhood Health, mainly the auditive health. In fact, identifying hearing problems in earlier stages helps to prevent the child's speech and language development, social skills and education. In Tunisia, these tests are trivialized because of the lack of specialists in audiology. In the frame of InSPIRES Project and "Science Together" (The Institut Pasteur de Tunis Science Shop), a multidisciplinary team regrouping Ichara CSO, audiologists, ENT and geneticists, researchers and students on audiology, sign language specialists was created and aimed to detect hearing impairments on earlier ages in several preschools and schools from Northern Tunisia. The current project was undertaken by a Licence-student on audiometry. It consisted of doing several audiometric and orthophonic tests on children aged between 3 and 6 Years-Old. This work was previously submitted to a biomedical-ethics committee. Before doing the work, the consents were signed by the tutors (the parents). It is worth noting that the parents were pleased to test the hearing health of their children, for the first time. The targeted population was 304 preschool and school children, originating from Northern Tunisia. However, only half of parents gave signed consents. After obtaining informed consents from the tutors, the children underwent the following audiometric tests: ear examination with an otoscope followed by tympanometry, oto-acoustic emission and tonal audiometry. Audiological examinations showed that 37 children (12 %) presented hearing impairments (30 mild, 6 moderate and 1 severe) and 29 children aged between 4 and 5 Years-Old had various speech disorders. Two 6 year-old children presented delays in language acquisition. Surprisingly, most of the parents were not aware of the hearing impairment of their children. Our science shop project showed the emergency to improve and multiply the campaigns for auditory health. This work is an advocacy we gave to the Department of School and University Medicine (Ministry of Health) to include the hearing tests among the medical examinations, especially in earlier ages for better medical, paramedical, educative and/or social taking-care.

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5. Community Creates Mobility: A participatory approach to invent the future of mobility in Austria

***Eveline Wandl-Vogt, Chiara de Eccher, Anna Gerhardus and Afamia Jaddah**

In spring 2019, various people from the mobility sector started to build a free and open mobility community. It represents a multistakeholder core of an emerging mobility ecosystem, an open system consisting of more than 80 organizations from industry, startups, science, civil society and many other committed mobility thinkers from DACH countries. We live in times of great challenges: climate change, urbanization, digitization in the economy or fluctuating cohesion in society. All of this is closely linked to the question of how we can enable environmentally friendly mobility for tomorrow and for all of us today. In this presentation, the authors focus on the organizational setting and the design of the approach. On the example of 3 virtual interactions / #digital learning journeys/ and one hybrid interaction with politicians the authors discuss the participatory orchestration of the ecosystem, introduce the community, refer to the virtualization during the COVID19 lockdown, outline learnings from the hybrid interaction as well as point to first results related to mobility of the future aligned to the SDGs.

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6. Technical & Research track - MUSICA: Multiple Use of Space for Island Clean Autonomy

***Gordon Dalton and Kevin Leyne**

The EU Atlas of Small Islands identifies 2700 islands. The Valletta Declaration launched the Clean Energy for EU islands initiative aimed at accelerating the clean energy transition for such islands. It calls for action to help islands reduce their dependence on energy imports by making better use of their own renewable energy sources and embracing more modern and innovative energy systems as well as for action in areas such as water and waste management. On-island energy solutions are often not suitable due to their perceived negative impact on tourism or simply due to the limited available space. Thus, there is a need for alternative solutions that address the specific needs of small islands. An international collaborative research project, MUSICA, is presented that will provide a full suite of Blue Growth (BG) solutions including a renewable energy system (RES), desalination and BG aquaculture service offshore for small islands. This decarbonising one-stop shop will be achieved by the further development and demonstration of a replicable smart Multi-Use Platform (MUP) and Multi-use of Space (MUS) combination as a viable enabling infrastructure for the small island market.

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Citizen Science for sustainable education

7. "Explore a lake": A multilevel citizen science project with focus on Sustainability

***Sara Egemose, Line Laursen and Thomas Kaarsted**

"Explore a lake" is a citizen science project involving ground schools, high schools, citizens, libraries, a media partner and researchers from University of Southern Denmark. Sustainability is a basic element in the project as the SDG's has a natural and high priority at University of Southern Denmark and therefore focus on sustainability and the relevant SDG's is also a natural part of the "Explore a lake" project. The first version of the project was completed in August and September 2020. The main aims in the project are 1) that the researchers gain more knowledge on the water quality in different lake types by water samples collected by school students and citizens in as many lakes as possible, 2) to increase public knowledge and awareness of environmental challenges like water quality and 3) to bridge different educational levels by offering research based teaching not only at university level, but also through teaching material, lectures and field work developed to ground schools and high schools as a part of the citizen science project. We will present the project and the gained knowledge.

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8. Introducing citizen science air quality monitoring projects in elementary schools in Norway

***Nuria Castell, Laura Gray, Sonja Grossberndt, Mirjam Fredriksen and Britt Ann Høiskar**

Citizen science can play an important role in school science education, being particularly relevant to addressing current societal environmental sustainability challenges, as it engages the students directly with environmental science and gives students an understanding of the scientific process through first-hand experience. Opening access to scientific research through formal education increases opportunities to improve interest and knowledge of young people in science. Here, we report on a citizen science education activity targeted at elementary schools in Oslo and surroundings. The activity took place in 2019, in the framework of Oslo European Green Capital. We invited students from elementary schools (age 8-9) to measure air pollution in their neighbourhood, using simple and affordable measuring methods based on paper and Vaseline. More than 60 classes joined the campaign in the period between 15 March and 15 May. The students designed a scientific experiment, defined the hypothesis and prepared the measuring devices. After a week, they retrieved the devices, used a scale to compare the amount of dust fastened to the Vaseline, and discussed the conclusions. All of the data gathered by the students was uploaded by the teacher to a website, where a map showed all the results from the participating schools. During the campaign, NILU scientists visited seven

schools in the area of Oslo and carried out the activity together with the teachers. We did pre- and post- test evaluations in those classes with a 10-question multiple choice test. The results show that using citizen science improved science instruction and helped knowledge integration by including student views and taking advantage of the diverse ideas students generated. The citizen science approaches employed in the schools, combined the four key elements that promote knowledge integration: elicit ideas, add new ideas, distinguish among ideas and reflect and sort out ideas. Citizen science gives learners an insight into the ways that scientists generate solutions for societal problems. But more important, citizen science provides a way to differ from the classic view of the learner as an absorber of information, by considering the social context of instruction and making the topic personally relevant.

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9. Unleashing the potential of Citizen Science as an educational tool towards the Sustainable Development Goals (SDGs): Quality education for an empowered society

Imane Baïz

This policy brief assesses the potential and challenges of citizen science (CS) as an educational tool and how it can contribute to achieving the Sustainable Development Goals (SDGs). While CS can address specific challenges across almost all of the 17 SDGs, this policy brief focuses on direct contributions to SDG 4, Quality Education, and asks: 'How citizen science can equip learners with life-long skills, knowledge and attitudes that foster change-making, using a blend of non-traditional pedagogies?' We demonstrate the roles that educational practices developed around citizen science can have by presenting a selection of inspiring initiatives currently taking place throughout Europe. Citizen science based education does not provide learners solely with an understanding of science and scientific methodology, but it also develops social skills used to communicate, take part in or coordinate multi-stakeholder projects. In this way, this policy brief aims to support decision makers in education and science policy, including the European Commission, national and state ministries and other stakeholders in integrating these non-traditional educational practices into existing funding schemes, education policy and curricula, towards more meaningful, transformative learning and teaching.

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10. The D-NOSES MOOC on Odour Pollution

Vicky Malotidi and *Iro Alampei

Odour pollution is the second reason for environmental complaints in Europe, after noise. Even though it can cause significant adverse effects on people's lives and well-being, it is an issue largely ignored in countries' regulations and even when regulatory frameworks do exist, citizens are often unaware of them and what actions they could undertake to combat it. D-NOSES - Distributed Network for Odour Sensing, Empowerment and Sustainability, is an EU-funded project aiming at empowering the citizens to become a driving force for change on odour pollution, through responsible research and innovation, citizen science and co-creation tools, applied together with the relevant stakeholders following the quadruple helix model at local, national and global levels. But how can citizens drive change if they are unaware of odour pollution, the existing regulations and their available tools to tackle it? Among other citizen-science tools designed and applied within D-NOSES, a Massive Open Online Course (MOOC) has been developed. It is open-accessed, self-paced and lasts about 3-4 hours. The MOOC aspires to be a helpful resource for affected citizens or communities and to enable them to bring along positive and transformative change. The MOOC comes in two versions, for the public and for educators. In both versions the aim is twofold: on one hand to increase knowledge on odour pollution (causes, impacts, regulations), and on the other, to engage citizens directly in measuring, reporting and co-creating solutions regarding odour pollution. Additionally, the MOOC for educators proposes ways to embed odour pollution in their teaching, either in formal (school) or non-formal (out of school) settings. It offers learning resources in the form of lesson plans for three age-groups, from kindergarten to upper secondary level. The MOOC was itself developed in a participatory way, based on the principles of Education for Sustainable Development (ESD): It is learner-centered, gender-neutral, inquiry driven, linked to everyday life. Also, it motivates responsible citizen action for odours, linking the local to the global, in the context of the Sustainable Development Goals (SDGs). Both MOOC versions are being piloted, while its learning resources (lesson plans) will be compiled also in a book-version.

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11. Composting and Indoor hydroponic farming as educational tools towards a sustainable future

***Nikolia Iliopoulou, Nikolaos Giannakopoulos, Emmanouil Petrakis and Maria Panitsa**

Composting is a natural process to turn organic material into a soil amendment. It is considered as a way to promote an environmentally friendly way to deal with waste. Food waste is an issue that is being addressed in connection with the United Nations Sustainable Development Goal 11. The target of SDG 11 is to make cities and human settlements inclusive, safe, resilient and sustainable. Many cities generate more solid waste than they can dispose of. Solid waste management is essential for the sustainability of cities. Especially it includes: waste reduction, reuse, recycling and composting. Without doubt, composting oriented towards the implementation of environmentally friendly practices encourages students to adopt a waste reduction plan

in their lives. Hydroponics is the method of farming where plants can be grown in nutrient water. By using all of the vegetables grown in the hydroponic farm in our student's snacks this project supports healthy eating choices. Also, given concerns of feeding a growing human population in a changing climate, scientists believe hydroponic technology may be able to mitigate impending food shortage by serving the UN SDG 2 "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture". Furthermore, hydroponics offers opportunities for significant water savings oriented towards achieving SDG 6. It can also eliminate the use of pesticides, fertilizers and herbicide. Undoubtedly, the indoor hydroponic farming project links classroom learning to the real world by creating an opportunity for sustainable gardening for the future. This study is realized in the framework of Erasmus+ project CS4ESD (Citizen Science for Education in Sustainable Development) and it is focused on composting and indoor hydroponic farming taking place at our school as part of the activities targeted to promote sustainable environmental educational practices. Both activities offer a valuable interdisciplinary teaching tool covering areas of the curriculum with many learning outcomes. In conclusion, our study offers an educational approach that aims to build awareness and knowledge of sustainability issues as well as to develop students that are able to think critically, innovate and provide solutions towards more sustainable patterns of living.

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12. Connecting schools with large research infrastructures in Physics through citizen science

***Emmanuel Chaniotakis, Jens Koslowsky and Sofoklis Sotiriou**

Scientific research in frontier Physics, including Particle Physics, Gravitational Wave Astronomy, and Astroparticle Physics, has provided humankind with breakthrough discoveries which help unravel the nature of the Cosmos from the very big to the very small and have produced numerous technological applications that have changed our lives forever. However, the knowledge and skills needed to be able to comprehend the science behind these discoveries and their impact to society, are far beyond the reach of the school curricula. Students are mainly exposed to discoveries through outreach activities, which, while being effective in temporarily drawing their attention to science, do not provide opportunities for active participation in the pursuit of new scientific knowledge, making them mere recipients of the scientific enterprise. Citizen Science, as opposed to outreach, has a great potential for professional development of educators, as well as for education of students, aiding in making them critical consumers of scientific knowledge. This fact arises from the fundamental aspect of "contributing to science - contributing to the world" that citizen science entails. The REINFORCE EU funded project (REsearch INfrastructures FOR Citizens in Europe) focuses among other target groups specifically on K12 students and educators in order to explore the potential contribution of frontier citizen science in formal, non-formal and informal science education. The poster will provide an overview of the educational requirements for the introduction of frontier Physics to secondary education using a citizen science approach, the proposed pedagogical design, and preliminary findings from the first teacher training workshop organized by the team. It will discuss student and teacher needs, considering mainly formal learning settings, and the anticipated impact on e.g. changes in students' content-specific knowledge, fascination with frontier science, students' career motivations, as well as the confidence of educators in interacting with citizen science and applying it in educational settings.

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Citizens in biodiversity monitoring

13. Citizen science, ways of avoiding plant blindness and plant species and communities' diversity monitoring

***Maria Panitsa and Nikolia Iliopoulou**

Plant blindness has been a serious matter since by its definition, it includes "the inability to see or notice the plants in one's own environment, leading to the inability to recognize the importance of plants in the biosphere and in human affairs". Among the serious issues of this century, global warming, resources conservation, biodiversity conservation, sustainability, etc. are plant based. Without knowledge of plant characteristics, of plant species diversity, endemism and rarity and of different plant communities and habitat types, we cannot address these problems for which the first steps for improvement is citizens' awareness, especially in protected areas such as Biosphere Reserves. It is important for young people to be trained to distinguish and recognize different plant species and communities that except many other fundamental functions, also give refuge to animals. It is important to be educated and to care about the environment and the natural resources. Traditional plant systematics may not be so attractive to young people but plant science education and modern ways of recognizing different plant species using their smart devices, citizen friendly applications and databases concerning plants and plant communities, can give them inspiration, cure plant blindness and make citizens part of the effort to improve some of the serious environmental problems of the new decade. Biodiversity monitoring, protection, and sustainability of Life on Land are issues that are being addressed in connection with the United Nations Sustainable Development Goal 15. This study is realized in the framework of Erasmus+ project CS4ESD (Citizen Science for Education in Sustainable Development) that uses citizen-science based tools and mobile applications to equip students to engage more deeply with the natural environment. It is focused on promoting the importance of plants and plant species diversity to young citizens, pupils, and students, by using field visits or even web-based information because of Covid-19 limitations, concerning the Olympus mountain Biosphere Reserve (Greece).

Citizens with basic knowledge on plants and plant species and communities diversity can report very useful information, accurate data concerning the targets of SDG 15-Life on Land, such as sustainably managing forests, halt land degradation and biodiversity loss.

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14. Pl@ntNet platform as a service for researchers and citizen scientists
***Pierre Bonnet, Alexis Joly, Antoine Affouard, Jean-Christophe Lombardo, Julien Champ, Hervé Goëau and Fabian Robert-Stoter**

Pl@ntNet is a citizen science platform based on artificial intelligence to help participants identify plants with their smartphones. The identification of plant species is a key component of many scientific, educational and land management activities. Involved in biology training, its difficulty to be accurate on a large scale, is often recognized by educators as the origin of the causes of the "Plant blindness", which limits environmental education in some aspects. As environmental education has been recognized by the Unesco, in the Tbilisi Declaration (1978), as one of the main tools for sustainable development, it is essential to attempt to solve this problem at large geographical, taxonomical and sociological scale in order to increase positive interactions between human and nature, and to develop responsibles societies. In the context of the European Cos4Cloud project (2019 - 2023), involving several european citizen science platforms (such as iSpot in UK, Natusfera in Spain, or Artportalen in Sweden), Pl@ntNet is developing innovative digital services aimed at (i) facilitating the integration of automated identification in other citizen science portals and (ii), allowing researchers to use Pl@ntNet data and tools for their own research. The implemented services will be provided on the European Open Science Cloud (EOSC), in order to increase capacity and interest of european scientists to implement citizen science projects dedicated to contributing to the SDGs. In this talk, we will present the newly developed services and give some insights on how they work, how they are evaluated and what are their current limitations.The tools currently available on the Pl@ntNet monitoring platform, as well as the data extraction methodologies that have enabled the publication of two large datasets on the world on GBIF portal, will be presented. In particular, we will present our last advances regarding the countrywide prediction of species distribution based on high-resolution remote sensing imagery and convolutional neural network. Results of the LifeCLEF campaign, an annual international scientific and technological benchmark based on Pl@ntNet data, will be presented in order to compare the most advanced recent machine learning techniques used to allow automated species identification and geolocation-based species prediction.

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15. From engagement to ecology: does it matter whether citizen science camera trap monitoring uses video or still images?
***Sian Green, Philip Stephens and Russell Hill**

In order to protect ecosystems and reduce biodiversity loss, effective monitoring of wildlife populations is needed. Remotely activated cameras, or camera traps, are a popular method for studying wild mammal populations. One of the challenges faced by researchers using camera traps is the ability to process the vast amounts of footage that can be collected in an appropriate timescale so that it can be used to inform conservation and policy actions. One solution is to recruit the aid of the wider public through citizen science, as it has been shown that high levels of confidence in accuracy of citizen science classifications can be reached by combining multiple classifications per image.
Camera traps can be programmed to take a single photo, a sequence of photos or a short video when triggered, so data format between different citizen science projects may vary. In order to create an efficient pipeline of camera trap footage processing, it is important to understand whether citizen scientists find photos or videos more engaging, and whether they are able to classify one format more accurately than the other. In order to test this, we collected data from paired camera traps and presented citizen scientists with separate photo and video projects.
Videos were more engaging and attracted a higher number of participants, a greater proportion of which returned to the project on more than one occasion compared to the photo project. Some participants classified footage from both projects, however, many only classified from one project, indicating differences in personal preference. Providing both options may have helped engage a greater number of people in total. Overall, the photo project received a greater number of classifications, likely due to the higher speed with which photo sequences can be classified. Nevertheless, the longer time needed to process videos may be countered by the high level of accuracy found in video classifications, meaning fewer classifications are needed per video, making the process more efficient. These results can guide the methodological design of future camera trap studies that aim to engage citizen scientists in data processing and make best use of classifications provided.

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Lightning talks

16. Sonification of the Impact of COVID-19 Lockdown
***Artash Nath and Arushi Nath**

On 11 March 2020, the World Health Organisation declared the COVID-19 outbreak as a pandemic. It swiftly led to a declaration of lockdown by countries around the world leading to the cessation of most economic and human activities. Provinces in Canada too declared emergencies closing all, except essential activities and services. On 23 March 2020, the province of Ontario went into a complete shutdown mode. As streets

became empty, stores, and business shutdown, we took this opportunity to measure the impact of the lockdown in our local environment. We built a homemade instrument to measure the changes in street sounds, traffic levels, air pollution, and seismic vibrations. We took measurements for over a month and included the lockdown period and at the end of stage one of the lockdown. It allowed us to compare the datasets to better understand the impact of the lockdown. We analyzed the massive datasets we generated using python and machine learning. The results were very interesting. We observed a decrease in pollution levels, street sounds, street-level traffic and even reduction in seismic vibrations of the earth as transportation, construction, and other human activities came to a halt. To present our analysis in a more interesting way, we used data sonification software to convert our data into a musical of the lockdown. By listening to the musical, one is able to comprehend the changes happening in the environment during and after the lockdown.

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17. Spatially resolved nitrogen dioxide concentrations in Berlin determined with diffusive samplers in a citizen science project

***Annelie Höhne, Wolfgang Frenzel, Andreas Held, Melissa Kulicke, Maren Telgmann, Rieke Schulte, Thu-Trang Huynh and Jannis Drossart**

Nitrogen dioxide (NO2) is a major air pollutant with adverse health effects. Currently, the main source of NO2 in Germany is road traffic, resulting in a complex spatial pattern of local emission sources in an urban area such as Berlin. Hence it is of particular importance to understand the spatial variability of NO2 concentrations. To generate a spatially comprehensive NO2 data set with diverse measuring sites, citizen scientists are involved in the process of air sampling with diffusive samplers. Besides obtaining a unique data set, raising the awareness of air pollution control is a major goal of the citizen science approach in our study. For diffusive sampling we use modified Palmes tubes [1] for collection periods of two weeks. NO2 is determined as nitrite by spectrophotometry using a variation of the Saltzman reagent. NO2 concentrations determined in a campaign in summer 2019 with 50 participants vary between 4 µg/m^3 in the northern outskirts of Berlin and 29 µg/m^3 in an industrial estate in suburban Berlin Mariendorf. The latest campaign in winter 2019/2020 with 121 citizen scientists participating yields much higher NO2 concentrations between 10 µg/m^3 in south-eastern Berlin and 43 µg/m^3 at a main street in inner-city Berlin Reinickendorf. While the order of magnitude in both campaigns is in good agreement with the Berlin air pollution network BLUME, the small-scale variability observed in the citizen science data set allows for an improved identification of NO2 hot spots, sources and sinks in Berlin as well as validation of urban air quality models.

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THEME 2.
CONCEPTS AND METHODOLOGIES FOR THE SDGS

Evaluation of programmes and projects: instruments, outputs, outcomes

18. Evaluation of citizen science initiatives from a qualitative perspective. Studying change in Open Science views within the ORION project

***Digna Couso, Marina Jiménez and Caterina Solé**

The H2020-SWAFS project ORION Open Science explores how research and funding organizations in life sciences and biomedicine can open up the way they fund, organize and do research. The project aims to trigger evidence-based institutional, cultural and behavioral changes, targeting researchers, management staff and high-level leadership. Citizen science is one of the ORION approaches to reach these ambitious objectives. In 2018, we launched an internal call to fund two citizen science projects in life sciences, and we are now supporting the two selected projects, from initial design to implementation and evaluation. In this context of evaluation, we have been documenting, evaluating and reporting the changes in Open Science (OS) culture of the research and outreach teams involved in the ORION-funded citizen science projects. The qualitative evaluation effort uses social science instruments and methods, including pre-post focus-group interviews, individual interviews to participating researchers and outreach experts, participant and non-participant observations of co-creation activities and documentation analysis. The study uses content and discourse analysis in a constant comparative method to identify issues and trends in the views of the participating researchers and team members.From this evaluation exercise, we have identified successful and limiting design principles when organizing a citizen science call for researchers. We have also reported improvement in knowledge about OS of participating researchers, and identified are concrete, both perceived and evidenced, advantages and difficulties for the participating researchers to run a citizen science project. The presentation will focus on the evaluation methodology, based on the three pillars, including: monitoring, measuring impact and promoting improvement, which could be used in other citizen science initiatives. In particular, the evaluation will be presented in connection with other evaluation initiatives of the ORION project, such as the comparison of citizen science participating researchers with other researchers according to the state-of-the-art instruments used in the project (e.g. ORION initial questionnaire), or with the views portrayed in reporting instruments (e.g. ORION inspiring stories).

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19. An innovative online tool to self-evaluate and compare Participatory Research Projects

***Anne-Sophie Gresle, Valeria Santoro, Anna Cigarini, Leonardo de la Torre, Irene Jimeno, Herman Dempere, Mireia Ribera, Eloi Puertas, Josep Perelló and María Jesús Pinazo**

Science Shops are knowledge intermediary structures that together with civil society organizations co-create research questions, deploy participatory projects to respond to society needs and support the translation of research results. Science Shop projects are a form of extreme citizen science as the research question is defined together with the community following a bottom-up approach. Depending on the complexity of the research question, the involvement of a wide range of stakeholders will be required, a perspective that is directly shared with objective no. 17 of SDGs. Science Shops projects can be deployed in a wide variety of contexts and tackle all kinds of thematic which make them of great value to address and contribute to the SDGs. However, while Science Shops have been running in some countries for more than 40 years, the impact evaluation's studies remain limited due to financial and time constraints. Several EU funded projects considered interviews and paper-format based questionnaires as the main techniques for performing impact evaluation studies, which makes comparison among projects difficult. Evaluation's conclusions are rarely published and shared, and as each project follows different formats and strategies, only limited evidence on best practices is available. The same weakness is also observed in Citizen Science. Inspired by a Citizen Science approach, and through the InSPIRES H2020 project, an innovative online-based evaluation methodology was developed. Valid for any participatory research initiatives, it allows projects to undergo a self-reflection and an evaluation process. The online-tool gathers and automatically analyses data in a harmonized way among projects and delivers the results through visualizations as a communication strategy. The dimensions evaluated by this online instrument are: (i) knowledge democracy (transdisciplinarity and relevance of topics), (ii) citizen-led research (alignment of project goals to the community demands and efficacy of engagement techniques), (iii) participatory dynamics (degree and quality of engagement), (iv) integrity (ethics, transparency of data management, gender, etc.), and (v) transformative changes (individual learning, personal growth, sustainability, impact on policies). This contribution will describe the development and the final version of the evaluation methodology and the tool, as well as showcasing preliminary results of some projects piloted through the platform.

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20. 138,000 mosquitoes and no end – evaluating the citizen science project 'Mückenatlas'

***Nadja Pernat, Helge Kampen, Jonathan M. Jeschke and Doreen Werner**

Comprehensive, long-term data collection about the distribution and phenology of invasive as well as native mosquito species that represent potential vectors of disease agents are needed to protect against infections, to estimate and reduce impacts on human and animal health and to predict how particular vectors will spread.
The 'Mückenatlas' (mosquito atlas) has been operating since 2012 as part of a formal nationwide mosquito monitoring programme, inviting citizens to support updating the knowledge of mosquito occurrence and distribution in Germany. Specifically, they are asked to catch mosquitoes at any opportunity without smashing them and to send the sample to the project's home institution, where the insects are identified and all corresponding data processed. As a reward, every participant gets an individual response and, if desired, a marker on the collector's map on the project website. By June 2020, over 138,000 mosquitoes were submitted to the 'Mückenatlas' by more than 25,500 participants. Although communication with participants, processing the submissions and using the data to create distribution maps of mosquito species in Germany are daily exercises, we have only recently started to evaluate the citizen science project as such. We have been looking at the 'Mückenatlas' from different perspectives and estimating the performance in terms of (1) scientific output, (2) comparison of particular parameters to conventional monitoring methods, (3) bias and explanatory power of the data, and (4) recruitment and motivation of participants. In our presentation, we will give a brief overview of the different approaches included in our evaluation scheme and show exemplary results for all of the four topics investigated. Our experience may trigger discussions on how citizen science approaches can be included into formal mosquito monitoring programmes worldwide.

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21. Do I have to analyse the data, too? Engagement patterns for data collection and analysis in a Citizen Science project on urban wildlife

Till Bruckermann, Hannah Greving, Milena Stillfried, Konstantin Börner, Robert Hagen, Sophia Kimmig, Anke Schumann, Ute Harms and *Miriam Brandt

Increasing numbers of Citizen Science (CS) projects enable citizens to engage in scientific research. Besides being a valuable research tool, CS is supposed to benefit participants by providing them with learning opportunities from their engagement in the scientific process. Nowadays, digital tools for data inspection, analysis, and discussion can be used for citizens to be able to draw conclusions from data and discuss their results online. Thus, digitally supported CS projects facilitate the engagement of citizens in the whole scientific process. How-

ever, while there has been some research on citizens' engagement in CS projects, no detailed analysis regarding citizens' actual engagement with different phases of the scientific process has been conducted so far. Therefore, we investigated how participants of three rounds of an online-based CS project actually engaged in data collection and analysis. In three rounds, citizens (N = 141, N = 132, N = 123) from a German metropolis participated in a CS project about urban wildlife. Participants had access to an internet platform to attain information, upload and analyze the collected data, and share their experiences and results in the forum. Across each round of the project, participants' activities on the platform were tracked. Each round consisted of two consecutive phases: 1. Data collection and identification phase: Participants assessed wildlife with camera traps, uploaded their pictures, and identified the species photographed; 2. Data analysis phase: Participants had the opportunity to graphically display collected data about wildlife in their own garden or across the city and analyze it using statistical tests. We calculated engagement metrics that indicated how active, how passive, how long, and how much time each day participants were engaged with the project on the platform. Based on these metrics, we examined participants' behavior across each round of the project and during the data collection and data analysis phases within each round separately. Our results indicate that providing opportunities for learning and analyzing data does not necessarily lead to active engagement of participants in all phases of the scientific process. We discuss the implications of our results regarding the role and engagement of participants in CS projects.

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22. Interchangeable map compositions in support of collaborative spatial intelligence

***Karel Charvat, Runar Bergheim, Raitis Berzins, Frantisek Zadrazil, Jan Vrobel and Petr Vacha**

Significant progress has been made in standardization of data access protocols and implementation of servers and clients capable of combining and visualizing remote datasets through mainstream OGC standards like WMS and WFS. This allows information to be flexibly re-used across organizational and thematic boundaries. This allows people to build spatial applications that combine public, proprietary and private information for a multitude of purposes ranging from spatial planning, to smart agriculture and, of great relevance of late, crisis management. However, as long as we only share data, this requires the users to be proficient with GIS and a wide range of technical concepts. "Maps are where data are transformed into knowledge", as the GIS-cliche goes, but while the phrase is worn the fact remains valid. It would add significant value to both government, business and private tasks if we had a mechanism for sharing complex map compositions that combine data sharing services, cartography, visualizations and geospatial markup. Shared map compositions should be possible to explore and interact with in mainstream proprietary and open source GIS tools and both online and desktop environments. We developed a proposed standard format for interchangeable map compositions building on the results of several previous hackathons. A map composition standard opens the door to another interesting innovation, namely an application that is to maps what Google Docs is to text documents. We are working in parallel with evaluating and extending the current draft specification for JSON map compositions as well as build a working prototype of a web based collaborative map builder application. It will also be possible to share the map compositions with desktop platforms (QGIS) as well as on various social media platforms. This ce is prepared together by two projects SmartAgriHubs and PoliRural and four Digital Innovation Hubs will be included: SmartAfriHub https://www.smartafrihub.com/home, PoliRural https://hub.polirural.eu/home, FOODIE SmartAgriHub https://www.agrihub.cz/home and http://dih.bosc.lv . The waork was part of challenges of the Kampala INSPIRE hackathon https://www.plan4all.eu/kampala-inspire-hackathon-2020/ and Dubrovnik INSPIRE hackathon https://www.plan4all.eu/dubrovnik-inspire-hackathon-2020/.

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23. Science Shop as an instrument for co-creation and Stakeholders engagement. Experience from the Institut Pasteur de Tunis in the context of the H2020 InSPIRES project

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As a public institution, Institut Pasteur de Tunis (IPT) is committed to answer in a socially responsible way to public health needs in line with RRI principles. In Tunisia, most of the Civil Society Organizations (CSOs) have to develop their capacities in setting and implementing collaborative projects to answer the needs of the society. In the frame of the H2020 InSPIRES project, IPT set up in 2017 a Science Shop called "Science Together" to implement co-created projects involving CSO's, scientists, students, local and national authorities. Science shops are one of the best tools when it comes to building a "science with and for society" project to tackle societal challenges. After 3 calls, one hundred and twenty social needs were collected in collaboration with the Tunisian platform of CSO's "Jamaity". A selection committee composed by different types of stakeholders was created in order to select the social needs according to three different criteria (Health, environment, vulnerable population). One pilot project was implemented in 2018, three projects in 2018-2019 and four others are being embedded in 2020. A reformulation process, realized by the different project stakeholders, aim to reformulate the societal need in a scientific research project. Each project

is financed and mentored by the Science Shop. The projects are designed using system thinking and interdisciplinary approach in order to answer complex questions and increase their social and scientific impacts. The results are disseminated according to the targets and evaluated by the actors of the project. "Science Together" IPT-SS adopt an inclusive process, considered as an instrument to reinforce the capacities of the CSO's, to assure their mission (sensitize and train communities) and to advocate their voices towards policy makers. During these three years, we identified the need to regularly adapt our approach for a better engagement of the stakeholders; setting up training modules on Ethics, dissemination, reformulation, etc.

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24. SIOR: Towards Democratization of Science

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SIOR (Social Impact Open Repository) is the first open-access repository in the world that showcases the social impact of science. It does not only provide access to science in an open and democratic way but also it enables the participation of citizens in science, as SIOR is linked to Wikipedia, allowing citizens to take part in the edition of contents related to the social impact of science. SIOR was developed in the framework of the IMPACT-EV project (FP7), which was selected to create indicators and a system to monitor and evaluate scientific, political and social impact of research. SIOR includes only research projects that are having or had social impact, and the evidence is peer reviewed and scored (1 to 10) according to a public set of indicators. Social Impact Scores included in SIOR are assigned according to the evidence of social improvements related to official social targets, such as the Sustainable Development Goals. SIOR is one of the key instruments included in the "Monitoring the impact of EU Framework Programmes" published by the EC, which defines the societal and policy impact indicators for all sciences in Horizon Europe.

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25. Promoting equity in health in open child and youth work - A participatory evaluation project

***Alexandra Schüssler, Elisabeth Rataj and Jan Fischer**

Participatory health research focuses mainly on health inequalities. Socially disadvantaged groups who experience negative consequences of social inequalities are empowered to initiate, develop and evaluate change in their community by applying participatory research methods. The project PEPBS – Partizipative Evaluation der Braunschweiger Präventionskette is promoting equity in health in open child and youth work. Three youth centers in the city of Braunschweig are taking part in this effort. The project is embedded in the German Research Consortium for Healthy Communities – PartKommPlus and is funded by the Federal Ministry of Education and Research. The aim is to support the adolescents´ sense of ownership and to give them partial autonomy in decisions regarding the center´s offers. A request to open and close a youth center autonomously with their peers only outside of business hours is supported and evaluated by PEPBS. A steering committee was created for the project´s duration, consisting of youth center´s professionals, municipal representatives and professional researchers. To reflect on the autonomous use of the youth center an online tool called Mentimeter is used. Furthermore, to describe the impact of the project on youth and structures an input-output-impact model is applied. It is expected that the adolescents´ self-efficacy rises during the project´s duration. The observed changes, including acquired competencies among the youth center´s visitors, and essential factors for success are reflected upon.

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Exploring human-nature-relations: Citizen Science in the Anthropocene

26. Engaging hearts and minds – do it with a song! Emotions as key for citizen science in the Anthropocene

***Sarah Darwin, Kim Mortega, Ulrike Sturm and Silke Voigt-Heucke**

Some scientific concepts and processes such as sustainable development and the Anthropocene are difficult to grasp, let alone experience for the majority of people. In order for sustainability action to occur, a larger percentage of the global population needs to be engaged. Citizen science may provide useful avenues towards building and sustaining robust knowledge communities. Experimentation and reflective judgment by the academic partner may be the key to successful engagement. Here, we present a Germany based case study of a citizen science project on nightingales (Forschungsfall Nachtigall). In this transdisciplinary project, we used cultural associations to find emotional ways of engaging new audiences with science and nature. The scientific and cultural approaches to the nightingale enable the participants to playfully bridge the borders between culture and nature and between the different disciplines and ways of thinking. The nightingale is a global migratory bird species. Spending the winter months in Sub-Saharan Africa and summers in a broad geographic range further north, this bird touches many cultures in Africa, Europe and the Middle East. While the nightingale is visually inconspicuous, its powerful song fills the night (and day) sky. The nightingale song has captured the hearts and imaginations of different cultures throughout the eras and regions. In this project, we therefore make a link between the different countries, where the nightingale can be heard, and the people who live there. This acts as an important step to understand migration and how nature protection in one region directly affects the life cycle of migratory species.

Since 2018, we have collected nightingale songs, recorded by citizen scientists via an app (Naturblick), made a collection of nightingale, stories, anecdotes and associations from different Berlin communities, and more broadly conducted an online survey on people's perceptions of the nightingale. Using emotions as key, the project thus stretched from an AI enabled song recording and recognition app to sewing workshops and picnic & poetry events to celebrate nature knowledge. We reflect on how different approaches can engage and connect different communities with nature and the Anthropocene through emotions.

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27. In My Backyard: a citizen science approach to the use of pesticides and fertilizers in home farming and gardening
***Rui Monteiro, Rui Pedro Almeida, Clara Roberti, Rui Coelho, Anabela Almeida and Augusta Almeida**

Stemming from the observation of the widespread practice of home farming and gardening and simultaneously of the lack of data regarding the use of pesticides, fertilizers and other unfriendly environmental activities in this context, In My Backyard, a citizen science initiative (https://rioneiva.com/nomeuquintal/), proposed to address this issue. As a pilot project funded within the ACTION accelerator programme (Horizon 2020), starting in February 2020 and ending in September this same year, In My Backyard focused on the Neiva river mouth, in Esposende, Portugal, grounded in a local Environmental NGO as its support structure. The project goal has been to understand the use of harmful pesticides and fertilizers for home farming and gardening and exploring sustainable alternatives. It has been doing so by collecting quantitative and qualitative data using different and complementary mediums, namely an online survey for characterisation of home backyards, local on-site visits and an anthropological video documentary on the relation between caretakers and their backyards, complemented with sensibilization and capacitation events. Results include a database on the collected information and its visual analysis, a booklet on sustainable practices grounded and arising from what we have observed on-site, a video documentary, and a photo gallery, all of which comply with an open data policy, by applying a Creative Commons open licence. For this session, we therefore propose to present and discuss our approach, which emphasises on close social relations, an overview of achieved results, how we have successfully dealt with covid-19 as it momentarily suspended our on-site visits, our partnership with the local municipality, how we have set-up and organised a multidisciplinary team of 6 from a citizen perspective, how the accelerator programme that funded our project has been key to achieve our results and improve our processes, and what we have been exploring as a possible future strategy.

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28. The Pandemic Silence Project, a global call for audio recordings to capture the change of the world's soundscapes during the COVID-19 pandemic
***Andreas von Bubnoff and Verónica Semeco**

Many aspects of the Anthropocene have been discussed and reported on, among them plastic pollution and climate change. But very few projects focus on what the human presence on this planet means for its soundscapes. At the same time, we live in an unprecedented moment of human history: An almost complete global shutdown of public life and travel in response to the COVID-19 pandemic. This presents a unique opportunity to capture how humans change the soundscape of the planet, which is why we've launched the Pandemic Silence Project, a global call for audio recordings of natural and human-made sounds. We will discuss what we have learned when running the project, challenges we've encountered, preliminary results, and how we plan to communicate what we are collecting to improve public awareness of nature sounds and noise pollution in the age of the Anthropocene in the context of the UN Sustainable Development Goals.

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Contribution of Citizen Science Data to Monitoring the SDGs

29. SmartAfriHub as platform for Agriculture Citizens Science in Africa
Tuula Loytty Loytty, *Karel Charvat, Hana Kubickova, Petr Uhlir, Jiri Kvapil, Akaninyene Obot, Felix Kariuki, Ronald Ssembajwe, Antoine Kantiza and Samuel Njogo

Plan4All association together with 18 cooperating international institutions organized INSPIRE Hackathon in Kampala, along with ten different challenges to answer problems regarding agriculture in Africa. As part of an extensive effort by European Union to create the Digital Innovation Hub (DIH) network, one of the hackathon challenges was dedicated to the evolution of SmartAfriHub that is a Digital Innovation Hub addressed on African needs. Challenge 2 had initially 73 people from 11 countries, mainly from Africa, sign up to the challenge, with many people having expertise and understanding in smart agriculture and already mentioned geospatial information. Most of the members were part of different institutions with extensive knowledge of agriculture. First phase purpose was to build community and facilitate participants communication under different platforms e.g. SmartAfriHub, Google Drive and WhatsApp, and to identify the pain points and problems in African agriculture. After organizing and setting up communication channels, the group proceeded to their data collection plan. The lack of open, free data was identified as the most critical bottleneck to move forward. The group decided to limit data collection

into four subject matters, economic, – farms, – weather, – and agronomic layers. Four different teams from four African countries were set up to collect data relevant to their subject matter. After the group set out to utilize collected data to create multi-layered maps by using a mobile application that was developed by another challenge of the hackathon. Idea was to turn collected data into multiple web-based maps, out of one dataset. The group of challenge 2 developed both the technical and social environment around SmartAfriHub. The platform functionalities and assets were improved to provide more diverse services, application and tools to the end-users. Creating new content and sharing it were important actions in raising awareness of the SmartAfriHub community and above all it was an essential part of the social learning of community members. Capacity building of group members by using the "Do It Yourself" – method was a deliberate strategy. The group gathered a massive amount of agriculture data and launched the phase to create their own composite maps on Africa.

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30. Authentication as a Service for Citizen Science to support the Sustainable Development Goals

Andreas Matheus

Achieving the ambitious goal of citizen science supporting the monitoring and implementation of the SDGs, not only requires political consensus, but also sustained technical interoperability protocols. As highlighted by the Stockholm Environment Institute, citizen science could be a critical discipline, providing valuable high-quality, timely and accessible data to support the SDGs. Such data streams in addition should strive to be FAIR (Findable, Accessible, Interoperable and Reusable). Ensuring data reusability and interoperability is a key determinant of successful citizen science. However, what we often see is an approach along the lines of "Don't have an account with us? Create one to participate". Account creation, management and maintenance is a barrier for entry into citizen science. Furthermore, such accounts create a sense that contributed data and insights may exist only in isolation and not be linked to other projects, initiatives to further proliferate citizen science. This presentation outlines our Authentication as a Service (Aaas) contribution to citizen science for better achieving interoperability and reusability of the data supporting SDGs on a technical level. A GDPR-compliant login service which is part of the LandSense project also supports seamless entry from university and research organisations worldwide. It offers straightforward options for developers to quickly add a common login when setting up new citizen science projects. This key LandSense result is now taken up and further extended by the H2020 Cos4Cloud project. We will demonstrate how experts can use the AaaS to achieve FAIR principles for citizen-powered data streams.

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THEME 3.
POLICIES, PLATFORMS AND NETWORKS TO ACHIEVE THE SDGs

Citizen Science platforms as a way to impact on the SDGs

31. Österreich forscht - a hub for citizen science in Austria

***Daniel Dörler and Florian Heigl**

The Austrian citizen science platform Österreich forscht (www.citizen-science.at) has been founded in 2014 and lists citizen science projects in Austria together with general information on citizen science, informations about several working groups in the realm of citizen science, and provides project initiators the opportunity to share their experiences with peers and project results and news through the platforms' blog. The goal of Österreich forscht is to bring science and the general public together, share knowledge and expertise and foster and secure the quality of citizen science. Since 2014, Österreich forscht has become the main hub for citizen science in Austria, bringing together the expertise of currently 39 institutions and almost 50 projects from all kinds of disciplines. Since the formulation of the Sustainable Development Goals, several different approaches have been used to tackle the SDGs in Austria. Three short examples showcase the effort of Österreich forscht in providing insights of how citizen science projects can contribute to the SDGs: (i) the platform coordinators have participated in a first conference on the SDGs organized by the Austrian Academy of Sciences in 2019, presenting preliminary analyses on the potential contribution of projects on Österreich forscht to the SDGs; (ii) the coordinators of the platform are also the editors of a special issue in Sustainability on the role of citizen science for sustainable development; (iii) the working group on open biodiversity databases for citizen science data is exploring how data from citizen science projects can be made publicly available. On Österreich forscht these approaches have been collected and summarized, to give an overview on these initiatives in this specific kind of research so far to further encourage others to start their own projects. To involve citizens more deeply in these developments, a hackathon on citizen science and sustainability is organized in September 2020 as a side event of the Austrian Citizen Science Conference, which will also be highlighted on Österreich forscht. In our presentation we present these different approaches, and how we at Österreich forscht are utilizing a national citizen science portal to share knowledge and experiences on this particular topic.

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32. REINFORCE-ing the SDGs

***Gary Hemming and Grant Miller**

In REINFORCE - REsearch INfrastructures FOR Citizens in Europe - individual demonstrators involved in cutting-edge scientific research - gravitational-wave detection, neutrino detection, particle identification and muon imaging - will create projects on the Zooniverse online citizen-science platform. REINFORCE wants to go beyond established traditional disciplinary frontiers, in terms of the ways in which we understand reality and to explore the interface between Art and Science, developing critical thinking in a world moving towards increased digital connectivity and remote working and experience. Considering this, we first look at the strengths and benefits of using a centralised platform to interface research areas and citizen scientists, before exploring the use of data-sonification techniques within the project in order to increase accessibility and foster a multi-sensorial approach via the online platform. We then provide an overview of strategies implemented within REINFORCE with the aim of promoting gender equality as well as covering the approaches adopted within the online platform in order to engage citizen scientists from diverse groups. We subsequently concentrate on the importance of leveraging online platforms to engage with and build a dedicated citizen-science community, and the ways in which the inter-connected and international nature of an online platform facilitates the supporting of citizen-scientists to help them to actively cooperate with researchers and, in so doing, to contribute directly to the development of new knowledge. We then look at how to nurture a two-way process between volunteers and researchers and the forging of interdisciplinary connections, as well as the significance of planning ahead, in terms of workflow planning and data releases, in ensuring a satisfying user experience and real sense of participatory involvement.

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33. RRING: Responsible Research and Innovation Networked Globally (RRING)

***Gordon Dalton and Erna Karalija**

A better collaboration and mutual effort are needed for an advocacy directed toward influencing public policy and decision-making by policymakers. Although there is a wealth of projects and consortium in this sector, a certain methodology is needed to use the acquired knowledge to drive and achieve great progress. That is why an international collaborative research project RRING seeks to connect researchers and research organizations into a strong community or network of professionals for responsible research and innovation (RRI). RRING goals are to establish and cultivate country by country, a true community of practice to learn, share and apply our influence to achieve ever more responsibility and freedom in research and innovation. In light of our experience and role in advancing research and innovation, and given the relevance of the Recommendation on Science and Scientific Researchers (2017) we would like to present your audience to join our newly established community for promotion of these common norms for science systems. The RRING community will function as an 'observatory' on responsibility in research and innovation promoting mutual learning, collaboration and opportunity for all its members. RRING will develop a community that will share knowledge, best practices and have a significant impact on responsible scientific research and technological development processes that take into account potential impacts on the environment and society.

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Who is engaged in Citizen Science – and who could or should be?

34. Enhancing inclusiveness in citizen science

Francesco Osimanti, Emmanuel Chaniotakis and *Valeria Andreolli

When taking part in citizen science projects, citizens encounter different kind of barriers and constrains, which need to be identified and addressed in order to tackle them. To do so it is fundamental to understand which are the motivations for citizens to join. At the same time, it is extremely important to define the target groups that citizen science projects aim to engage and to develop a citizen engagement methodology, taking into account the special characteristics of different target groups, their perceptions and biases and their attitudes and knowledge regarding science, and identifying which are the most active groups engaging in citizen science project. One of the core aspects of the EU-funded project REINFORCE (Research Infrastructures FOR Citizens in Europe) is the exploration of the potential impact of citizen science in disadvantaged groups in terms of visual impairments, age, gender, rural residencies, or social criteria. The ambition of the project is to include in the overall effort and scientific community sense-disabled people (especially visually-impaired), senior citizens, but also artists and larger percentages of women. All these groups will enrich the project by bringing external insights into the endeavour. For example, the interplay between Art and Science can benefit disadvantaged groups in the framework of frontier Citizen Science, helping to re-conceptualise fundamental concepts, techniques and representations, such as the nature of space and time, the notions of origin and horizon, the role of information circulating in the universe and its non-conservation. This is a very innovative approach that REINFORCE aims to adopt in order to make citizen science the most inclusive possible.

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35. Volunteers or free workers: meeting the expectations of researchers working with citizen science platform

***Alexandra Borisova and Alfiya Maksutova**

In our talk we want to share the experience of Russian national citizen science platform "Lyudi nauki" ("science people") in recruiting the researchers and scholars to start their own citizen science projects. "Lyudi nauki" is the first platform of its kind in Russia, the team of the Russian Association of Science Communication (AKSON, www.akson.science) creates it with the support of the Civil Society Grants Foundation. Russia has a history of citizen scientists working in the international projects in the platforms like iNaturalist and Zooniverse, but scientists themselves limited the participation to the volunteering help in the archaeological field works and experiment participants for psychological and neuroscience research. As a national citizen science platform, we aim not only to engage lay citizens to work as citizen scientists, but also to encourage professional scientists to rethink their research so that the help of citizen scientists can be used to both balance costs and enrich the quality of the research. In our pilot interviews with Russian researchers we found that many of them are scarcely familiar with the phenomenon of citizen science. Some see citizen scientists as a kind of free manpower thus expecting special knowledge and "worker-manager" subordination. Others feel uncomfortable with delegating their data collection to lay citizens. Partially this might be due to the lack of skills in statistics and working with big data. Our work is in progress now, and we consider initiating the special grant programme for citizen science initiatives among researchers. This might help them starting interdisciplinary collaborations with data scientists and social scientists that would add the skills needed to run successful citizen science projects in the field of biology, ecology, climate change, health sciences, etc.

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36. ALLINTERACT: Widening and diversifying citizen engagement in science

***Ramon Flecha, Elisabeth Torras and Oriol Ríos**

When people appreciate advancements in their everyday lives, often they do not link these to the research that led to them, especially when such advancements come from the field of social sciences and humanities (SSH). Nevertheless, when individuals are aware of the social impact of scientific outcomes, they do not only welcome and demand such research, but also are more willing to actively participate in it. Building on this, the H2020 SWAF project "ALLINTERACT" focuses on identifying those scientific actions that succeed at increasing citizen participation in science, by raising awareness on the social impact of research. To this end, the project sets as foreground two SDGs "Gender equality" and "Quality Education, while paying special attention to the participation of members belonging to vulnerable groups (individuals from low socioeconomic background, ethnic and religious minorities, women, LGBTQI+), as well as young individuals. In order to achieve its goal, ALLINTERACT has been designed under the frame of the communicative methodology, which has the principles of co-creation as its very basis. In this vein, this methodology counts on citizen participation at all stages of research, not only in data collection, and has succeeded at promoting transformative research with vulnerable groups (Gomez et al., 2019).

Already at its initial stage, ALLINTERACT provides new knowledge on building the bases of citizen participation in SSH research, by setting the focus on raising awareness of its social impact. As well, it contributes to opening citizen science to those who have traditionally been excluded from it, overcoming asymmetries in citizen participation and increasing the recruitment of new talent for science.

Reference

Gómez, A., Padrós, M., Ríos, O., Mara, L. C., & Pukepuke, T. (2019, February). Reaching social impact through communicative methodology. Researching with rather than on vulnerable populations: the Roma case. In Frontiers in Education (Vol. 4, p. 9). Frontiers.

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37. All for one – one for all? Artistic Endeavours in Citizen Science

***Pamela Bartar and Christine Marizzi**

The input tracks potential answers to the questions: How can artists and artistic researchers contribute to citizen science and societal or social transformation processes; and what are possible limitations due to artistic or scientific self concepts? After a brief introduction on the idea of self-concept in transdisciplinary research and citizen science followed by an explanation on collaborative knowledge production in the arts, the input will discuss selected art and citizen science projects (including science communication) by taking the position of a critical friend along following considerations: Citizen science and the arts may find common ground in the drive to conduct scientific research through shared experiences. Both spheres harbour traditions building collaborations with experts and the public equally forcing the societal status quo with critical questions and inquiries. Both, the arts and citizen science respond to a certain curiosity as well as providing a path for community research, learning, reflection or negotiation. In some cases, citizen science projects involve dramatization, motivation, action and public display and turn scientific experiments into a shared experience. The art sphere sometimes works with the individual contribution of those affected and highlights the fragile complex of cooperative and community-based inquiries. While science communication projects repeatedly showed interest in artistic approaches and the collaboration with artists, there are only rare examples in which artists have been involved in leading roles of citizen science processes. In the meanwhile, socially engaged art or design has brought forth projects showing the efficiency of artistic approaches in collaborative knowledge production and the contribution of idiosyncrasy brought in by artistic thinking and actions – a tradition that has been initiated by 20th

century artists such as Joseph Beuys (social sculpture) and continued more recently by international artists such as Brandon Ballengée (art & environmental activism) or Jay Koh (art-led participative processes) working on transdisciplinary projects with volunteers from different fields and disciplines. The input takes advantage of the feedback gained during workshop sessions with art and art education students at the University of Applied Arts in Vienna as well as of expert interviews with artists and researchers.

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Partnerships towards the goals – Making sustainable change sustainable with Citizen Science

38. The D-NOSES model using the quadruple helix framework as a way to achieve sustainable societal transformation in an odour impacted world

***Lucia Errandonea, Simone Ruefenacht, Nora Salas and Maria Alonso**

Odour is reportedly the second most frequent reason for environmental complaints across Europe (Dunod, 2005). Nevertheless, there is a lack of Europe-wide definitions, terms and criteria to establish impact odour thresholds. Partly, this is because odours are difficult to measure. But more importantly, solutions are costly and industrial stakeholders frequently oppose regulatory initiatives. The D-NOSES project aims to investigate how citizen science approaches and participatory strategies can empower citizens to take a leading role in tackling odour pollution. The D-NOSES methodology is structured to support and guide equal cooperation to tackle odour pollution through the active involvement of key actors of the quadruple helix model (public administration, business, civil society, academia). This is one of the challenges of the approach -related to the SDG17 "how to orchestrate the engagement and partnership of different stakeholders -citizens, CSO's and NGO's, industries, local & national authorities, and odour experts, etc.". Each stakeholder is affected differently by odour issues which leads to conflicting interests and goals. To promote the conversation between key actors and their aims, D-NOSES has defined policy-society scientific dialogues to establish commitments among stakeholders, mitigate conflicts and address concerns. Aligned with the RRI principles and the SGDs, the D-NOSES methodology is being tested and improved in 10 pilot case studies across Europe, as well as in Chile and Uganda. The resulting approach is aimed to be replicable, to generate scientifically valid and actionable data through citizen science interventions to improve people's lives. D-NOSES will leverage these results to propose standards for odour regulation at local, national and international levels. Actions and policies resulting from open discussion and consultation with the public, such as in policy-society scientific dialogues, have shown to be generally more widely accepted and aligned with societal needs. D-NOSES will thus provoke governance changes in a way that encourages sustainable societies. In this contribution, we will discuss the conditions of the D-NOSES methodology, as well as the lessons learned from the different approaches taken (such as the policy dialogues strategy), to feed into future directions for a framework that encourages sustainable societal transformation through citizen science.

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39. Co-Creation and Citizen Science: Creating Partnerships towards Sustainable Change on the Neighbourhood Level

***Lukas Franta, Nadine Haufe, Niklas Schmalholz, Ralf Brand and Astrid Großmann**

Climate change and related discussions on sustainability demand new concepts for shifting energy consumption and transport patterns in cities, and command new requirements towards liveability and health (SDG No.3, 7, 9, 10, 11, 12, 13, 17). In the early 21st century, urban (traffic) planning is still executed often in a rather technocratic way, without awareness of and knowledge about the "real lives of real people". Thus, co-creation processes foster sustainable cities and communities thanks to its systemic involvement of citizens and local stakeholders along all steps of the innovation process. Co-creation in urban planning is a rather new and much discussed concept and is understood as the ensemble of mutually influential processes, in which actors from different sectors of society interact and collaborate for finding solutions to urban challenges (Haufe & Franta 2019). For making change sustainable with citizen science, co-creation offers the opportunity to foster partnerships between citizens and other stakeholders towards the achievement of SDGs.

For SUNRISE, a Horizon-2020 project, co-creation is the key concept to develop, implement, assess and facilitate learning about new ways to address urban mobility challenges at the neighbourhood level. Stimulating innovative, sustainable participatory processes and problem solutions in neighbourhoods for new mobility concepts is the main goal of SUNRISE. Six cities (Bremen, Budapest, Jerusalem, Malmö, Southend-on-Sea, Thessaloniki) set up co-creative processes in specific neighbourhoods with the mandate to implement innovative solutions with residents and thus foster behavioural change regarding everyday mobility practice. In this contribution, we give an overview of the six co-creation processes in SUNRISE for planning sustainable mobility solutions on the neighbourhood level, and examine opportunities and challenges of co-creation for the achievement of SDGs. Thanks to a wide range of participatory methods with a diverse set of citizen groups, such as seniors, young people, mobility impaired or citizens with a migration background, we are highlighting inclusive ways to shape neighbourhoods and foster cooperation among local communities.

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40. Participatory Designing a Knowledge Graph for the Sustainable Development Goals: A Value Case Study on the Example of SDG17

***Eveline Wandl-Vogt, Andreas Brandner, Rob Brennan, Renato Rocha Souza, Andy Way**

In this presentation, the authors introduce a value case study regarding a knowledge graph for the sustainable development goals conducted in 2020. The multi-organizational team was collaborating with the UN One Planet Network. The Network has been formed to implement the 10-Year Framework of Programmes on Sustainable Consumption and Production, which supports the global shift to sustainability in it's domain and the achievement of SDG 12. It furthermore serves as a case study for a multi-stakeholder partnership of quiet diverse partners with a global scale. The presented poster focuses on the design and implementation of a participatory approach towards a knowledge graph. The knowledge graph is now freely accessible under a MIT license via github. During COVID19 lock down, the team focused on digital interactions to combine methodologies of knowledge management, participatory design, design thinking as well as semantic technologies to develop a unique tool to access knowledge provided by a multi-stakeholder partnership. The poster offers insight in the design of the participatory approach, starting from the problem sourcing, the digital versus analogue dimension of our approaches as well as the design of the innovation, knowledge co-creation and evaluation process. The main characteristics of our approach are related to problem sourcing with an already existing group and connecting the relevant knowledge carriers as well as the trust holders in an innovation network to take action. We align expectations accordingly to the diverse reward systems and design an iterative process which is scaled up. Finally, we aim to adjust our analogue world methodologies to the digital realm as much as possible. Concluding, our current results are briefly introduced, which are a knowledge graph prototype and a related white paper "knowledge graphs for the sustainable development goals".

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41. Responsible co-creation for research and innovation systems

Marianne Hörlesberger and *Andrea Kasztler

In the framework of strategic regional development in a European context we present a method of building future visions and deriving concrete actions for research and innovation (R&I) systems. We regard any research, innovation, economic, and ecological system as a complex system. We all live in such systems. They consist of many different and autonomous actors or components. These are interconnected and interdependent and they belong to one of the four groups of a quadruple helix, i.e. science and research, business and industry, policy makers and intermediary, NGOs and civil society. For R&I systems there is increasing demand on prospective and strategic methods and tools in policy and management. The acceleration of change in science and society requires scenarios beyond short-term planning. Interdependencies and international networking are growing, hence classic planning has its limits, as the scope of actions for individual actors too. Therefore, coordinated actions are required. There is need for common orientations and integration of different perspectives and disciplines. Mobilisation of the involved R&I stakeholders through participation in a co-creation process supports the implementation of concrete decisions. We present a specific methodology based on scenario development techniques as a very structured way for co-creating futures with affected R&I stakeholders. Through this process a combination of knowledge, governance and institutional changes, socially inclusive participation, and close international collaboration and mutual learning is possible. In combination with the approach of responsible research and innovation (RRI) this kind of stakeholder co-creation process addresses new ways for approaching the Strategic Development Goals (SDGs). This contribution works out how the RRI approach, developing futures in a foresight process, and stakeholder engagement create new awareness and lead to more sustainability. Firstly, the paper works out the base of responsible research and innovation, our specific foresight process, and adequate stakeholders. Secondly, we show how our specific foresight process addresses the four RRI process dimensions "diverse & inclusive", "anticipative & reflective", "open & transparent", "responsive & adaptive" towards regional innovation systems. Thirdly, examples of successful implementation are presented. Fourthly, specific challenges and an outlook are addressed.

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42. Citizen science as innovative form to solve social problems in local communities

***Egle Butkeviciene, Monika Maciuliene, Balint Balazs, Egle Vaidelyte and Grete Vaicaityte**

This paper aims to explore the potential of citizen science as an innovative form of engaging citizens in solving social problems of local communities and developing social innovations. Usually, the social innovations are understood as new ideas, projects, and the knowledge that results in some social change (Westley and Antadze, 2010). Social innovation is a "new solution to a social problem which is more effective, efficient, sustainable or fairer compared to existing solutions, and which generates value primarily for society instead of single individuals or organisations" (Phills et al., 2008, p. 36). It emphasizes a bottom-up approach, citizen involvement, and public participation. Meanwhile, citizen science also is related to engagement of non-professionals into scientific research, participatory practices, public participation (Dickinson et al., 2012). In this paper, we undertook a

systematic literature review (articles in Clarivate Analytics & Scopus databases), using the keywords "CS" and "welfare ", "social innovation", "social problems", "community", "co-creation" for selection of articles for the analysis. We discussed synergies among these concepts, also exploring the potential of citizen science in addressing the social problems of local communities and identifying the barriers and motivation for stakeholder involvement in the development of citizen science projects.

References

Dickinson J.L., Shirk, J. , Bonter, D., Bonney, R., Crain, R. L., Martin, J., Phillips, T. and Purcell, K. (2012). The current state of citizen science as a tool for ecological research and public engagement. Frontiers in Ecology and the Environment, 10(6): 291–297, doi:10.1890/110236

Phills Jr., J., Deiglmeier, K., and Miller, D.T. (2008). Rediscovering Social Innovation. Stanford Social Innovation Review, 6: 34-43.

Westley, F., and Antadze, N. (2010). Making a Difference: Strategies for Scaling Social Innovation for Greater Impact. The Innovation Journal: The Public Sector Innovation Journal, 15(2): article 2.

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43. New Partners in Citizen Science: A Single Point of Contact as a Sustainable Model for future Partnerships

Thomas Kaarsted and *Anne Kathrine Overgaard

In order for Citizen Science to grow and be further developed over the next decade, the phenomenon needs a transformation from "the blooms of a 1000 flowers" to a shared framework for equal cooperation in cooperation with civil society as well as other R&I stakeholders such as public authorities, media, businesses and industry, and research and academic institutions. This is important on the 'grand' international scale, but perhaps critical on the national or regional scale. Universities and their libraries are a place to start. Based on the BESPOC-model (Broad Engagement, Single Point of Contact) (Ignat & Ayris 2020) this presentation outline and discuss the work at The University of Southern Denmark (SDU) in order to build new sustainable partnerships while striving to achieve the UN SDGs. Based on the SDU commitment of moulding a sustainable future by breaking down boundaries and removing limitations, the presentation (1) discuss the current SDU-model and partners since 2017, (2) briefly present current Citizen Science projects and their link to the UN SDGs, and (3) present a BESPOC-model in the form of a Knowledge Center as a best practise for the mediation between scientific independence and participatory expectations with the goal of creating sustainable partnerships and aiding democratic literacy.

An urgent point is to form Citizen Science partnerships based on the SDG's in a dialogue with 1) media partners and 2) public schools and high schools while building on social innovation and scientific literacy (Golumbic et al 2020), this in order to enhance mutual learning as is required for the sustainable transformation to a sustainable society.

References

Fritz et al. (2019). "Citizen science and the United Nations Sustainable Development Goals". Nat Sustain 2.

Golumbic et al. (2020): "Science literacy in action: understanding scientific data presented in a citizen science platform by non-expert adults". International Journal of Science Education, Part B. Communication and Public Engagement.

Ignat, Tiberius, and Paul Ayris (2020). "Built to Last! Embedding Open Science Principles and Practice into European Universities". Insights 33 (1): 9.

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44. Environmental Governance and the Sustainable Development Agenda: With or Without Grassroots Citizen Science?

Michiel Van Oudheusden

How do grassroots citizen scientists mobilize data and technologies to tackle environmental threats such as climate change and air pollution? And how do public authorities and scientific experts, among other environmental stakeholders, respond to these practices? In this presentation, I will shed light on these questions based on my social scientific fieldwork on citizen science in Japan and Belgium. I will address the main challenges and pitfalls that emerge in processes of citizen engagement with science, with the aim of exploring possible synergies between grassroots and formal institutional governance approaches. My intention is to attune citizen science tools, data, and practices to the global Sustainable Development Agenda by making formal institutions and citizen-led environmental initiatives more mutually responsive to one another.

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45. Responsible research and innovation fostering citizen science in additive manufacturing innovations

***Toni Luomaranta and Elena Sischarenco**

Additive manufacturing is a relatively novel technological innovation and its use in for example in biomedical applications and innovations has been growing. AM is anticipated to be important for manufacturing increasingly customized implants and prosthesis for specific patient needs. Further research and innovation are needed in the areas of bio-compatible materials, AM manufacturing technologies, physiological and clinical testing as well as in the operational practices to cover the whole process from diagnosis to implant manufacturing to surgery. In the contemporary innovation theories, it is not purposeful to conduct these types of research and innovation projects in isolation within one organization, but to involve different types of skill sets from different types of organizations to seek solutions for challenges. For an emerging technological innovation such as AM, inclusion of as diverse as possible set of societal actors will be beneficial to co-steer the development into the direction UN Sustainable Development Goals. Project IAMRRI, funded from EC's Horizon 2020 program, is studying AM innovation processes from network

perspectives. The aim of the project is to understand the AM innovation processes holistically; who are the actors participating, what are their inputs for the innovation, what mechanisms explain the innovation process and its success, and if and where are there openings for responsible research and innovation principles in the innovation process network. Responsible research and innovation (RRI) is a concept fostered by EC, where public engagement, open innovation, open science and open access are some of the key thematic areas. Later in the project these identified RRI openings are simulated using complex social simulation to get insight of how the RRI principles can spread trough the AM innovation network to help for example policy makers to anticipate possible futures. This presentation will introduce the project IAMRRI and illustrates how and where citizen science approach is possible to implement in the AM innovation process of biomedical applications. The potential openings are defined and conceptualized based on AM case studies, multiple AM expert interviews and knowledge created during IAMRRI project.

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Opening Social Science & Humanities research towards society: Required institutional settings

46. UniswithHeart: Student networks leading the struggle for universities free of sexual violence

***Ana Vidu, Gema Tomás and Lidia Puigvert**

The Marie Sklodowska-Curie IF UniswithHeart aims at presenting in which ways social movements struggle to eradicate sexual violation; inquiring on social actors engaged, resistances faced and overall, how are contexts of zero tolerance shaped in which victims feel empowered to speak up. Power structures and complicities are often limiting student movements from effective organizing in preventing harassment. Overcoming sexual violence is crucial for a free and best academic development. The problem of sexual violence in universities and institutions worldwide is getting international attention. In this watershed moment, European Student Networks of Support (SNS) are progressively acting to prevent and respond to this issue. Drawing from this, the project uncover effective strategies and mechanisms of SNS and the movement against sexual violence in universities, focusing on how it successfully performs and got to be so widely recognized. The emergence of these social movements count on the support of active bystanders, including scholars who develop research and action for and with the public, committed to improving the existing civil society worldwide. In this line, the role of public sociology in promoting SNS is also explored. Their empowerment is influencing not only academic policies against sexual violence but also political changes, legislations. Thus, impact is based on three realms: on personal and professional success of direct and second order victims of sexual harassment in academia; on effective university policies; as well as on regulations beyond academic institutions. The gap to be filled in this sense, focuses on the emerging and articulation of Student Networks of Support illustrating the knowledge of their development and repercussion while successfully influencing administrations, political spheres and legislations, making the EU leader not only in social science research but also in contributing to foster pioneer regulations against gender-based violence. Expand the debate on sexual harassment in academia to all the public helps to get social support and zero tolerance contexts for victims to speak up. The UN Sustainable Development Goals (SDGs) entails building actions for gender equality and free harassment institutions.

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